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Toward an Operational Definition of Workload: A Workload Assessment of Aviation Maneuvers

By Catherine M. Webb
Steven J. Gaydos
Arthur Estrada
Lana S. Milam

United States Army Aeromedical Research Laboratory

Warfighter Performance and Health Division

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Arthur Estrada
Lana S. Milam

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14. ABSTRACT

As there is no one agreed upon definition of workload, there is no one accepted way to measure the construct. However, workload is an important variable in nearly every aviation-related research protocol. The primary objective of the study was to explore a new measure of workload assessment in an effort to move towards an operational definition of workload. Using this new workload assessment and definition, the present study characterized aviators' retrospective assessments of the workload involved in base and mission tasks related to the UH-60 A/L aircraft. A secondary objective was to examine the role of experience in workload assessments. Eligible participants were UH-60 Black Hawk instructor pilots or pilots enrolled in the UH-60 instructor pilot course at Fort Rucker. The present study demonstrated the new workload assessment was sensitive to various tasks and various workload dimensions. The results of this study also have applications for return-to-duty assessments for H-60 model aviators.

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Introduction

There is great debate in psychology regarding the meaning of the term workload. At a simplified level, workload can be defined as the cost of accomplishing a task for a human operator. These costs can be fatigue, stress, and errors to name a few (Hart, 2006). According to the information processing model, an operator has only a limited amount of resources, both physical and mental, to complete a task. A high workload task may demand more resources than that which are available, and performance on the task could decline (Hendy, East, & Farrell, 2001).

It should be noted that research demonstrates a distinction between experts and novices with regard to the amount of resources a task demands. Fitts and Posner (1967), in their classic book on skill acquisition, describe the process of acquiring a skill as occurring in three phases: 1) the cognitive phase 2) the associative phase and 3) the autonomous phase. The first phase demands a great amount of resources as performance is slow and prone to errors. During this phase, strategies are being formulated and evaluated by the learner. With practice, the learner moves into the second phase, where optimal strategies are strengthened. The final stage of skill acquisition requires little cognitive resources as performance is nearly automatic, and attention can be directed to other tasks. Therefore an expert's opinion of a task's workload would tend to be lower than that of a novice.

In the perspective of the information processing model, when a task's workload is high, performance on that task will often decline. With regard to piloting an aircraft, performance decrements can have devastating consequences. Common errors include, but are not limited to, slowed reaction time (Wickens, et al., 1986.), errors in crew communication (Hart & Hauser, 1987), and spatial disorientation (Young, 2003). The increasing awareness of workload-related errors is a major influence in future cockpit design, with the goal of creating displays and aircraft systems to reduce pilot workload.

Workload researchers do agree that workload is a multidimensional construct (Hart & Hauser, 1987). Despite being commonly referred to as *mental workload*, a task's workload is based on a number of factors, including cognitive, physical, and sensory demands. However, not all models of workload evaluate the same dimensions. For example, the well known NASA Task Load Index (TLX) incorporates mental, physical, and temporal demands as well as the operator's assessment of his/her performance into its model of workload, whereas the Subjective Workload Assessment Technique (SWAT) considers the operator's time pressures, mental effort, and psychological stress.

As there is no one agreed upon definition of workload, there is no one accepted way to measure the construct. There are three main categories of workload measurement: physiological measurement, secondary task performance, and subjective assessments. It should be noted that because workload is a multidimensional construct, it is unlikely that any single measure will be adequate for all situations (Hart & Hauser, 1987). Physiological workload assessments include, but are not limited to, heart rate, blink rate, salivary assays, respiration data, galvanic skin response, oculography data, and electroencephalograms, with the belief that the stress associated with the increased workload will cause measurable changes in the participant. However, these

measures tend to be obtrusive and yield varying results among studies (Wierwille, Rahimi, & Casali, 1985). Secondary-task workload assessments measure a participant's ability to perform an additional task while he or she is also performing the main task. Common secondary tasks include simple tests of memory, arithmetic and tracking. The theory behind secondary task assessment is that the more resources the main task requires (i.e., higher workload) less resources will be available to perform the secondary task, and the secondary task performance will decrease. Finally, subjective workload assessments ask the individual who performed the task to assess his/her experience of the task. Two well known subjective workload assessments include the NASA TLX and the SWAT, which are both multi-dimensional assessments that are typically administered immediately after performing a task. Typical subjective assessments ask participants to rate the various workload dimensions on a Likert or visual analogue scale. Subjective workload assessments are very simple to administer, cost-effective, and less invasive than physiological measures. Subjective assessments are described as static, in that they evaluate the workload of a task as a whole. This may mean that moment by moment variations in workload are unavailable, compared to data obtained from constant physiological monitoring (Lee & Liu, 2003). However, assessing operators' opinions may be closest to "tapping the essence of mental workload" (Moray, 1982).

Subjective workload assessments can be further differentiated by the time period in which they are administered. Typically, they are given immediately after the rater performs the task. There have been attempts at using projective workload assessments (Vidulich, Ward & Schueren, 1991), which ask experts to rate how demanding they expect a task to be based on a description. One advantage of projective assessments is that findings can be incorporated early into a design process of new technology. Finally, workload assessments have also been conducted retrospectively, meaning after all tasks have been completed. Assessments have ranged from 48 hours to 10 weeks (Hill, Zaklad, Bittner, Byers, & Christ, 1988) after completing tasks.

The effect of delayed reporting on workload ratings is an important consideration for retrospective workload analyses. There are issues related to memory retrieval that may suggest that long delays may negatively affect workload ratings. However, retrospective analyses have been found to have greater test-retest reliability than immediate ratings (Marras & Karwowski, 2006). Tsang and Vidulich (1994) commented that delayed rating techniques encourage deliberation based on prototypical memories of task conditions and are less affected by random influences like distractions and fatigue. One example of a retrospective workload assessment is the Analytic Hierarchy Process (AHP) developed by Saaty (1980). The AHP is a redundant assessment, in that all tasks are compared to each other. Vidulich, Ward, and Schueren (1991) described the benefits of the AHP, including that it makes use of "raters' decision making and experiential knowledge to extract expert judgments about workload."

The present study proposes a new subjective workload assessment that is retrospective, multidimensional, and absolute. It was developed for the purpose of having several experienced aviators evaluate the workload involved for the base and mission tasks associated with the UH-60 A/L Black Hawk airframe. These tasks are described by the Aircrew Training Manual (ATM) Utility Helicopter H-60 Series (Department of the Army, 2007). This ATM "provides specific guidelines for executing H-60 aircrew training" and covers all phases and required tasks of flight from mission planning and preflight through engine shutdown. The new workload assessment is

multidimensional, as pilots are asked to assess mental, physical, visual, aural, and verbal demands of each task. The new assessment is a cost effective method of assessing workload that can be distributed to several aviators at one time. Data obtained from this new method could be a useful contribution to the understanding of aviators' perceived workload. It should be noted that the original ideas for the assessment method were first proposed by Adam and Estrada in 2003.

Workload is an important variable in nearly every aviation-related research protocol, whether the focus is on evaluation of new technologies, such as head mounted displays, or on assessment of cognitive performance of aviators. Research has demonstrated that certain maneuvers, such as take-offs and landing, are more demanding than straight and level flight (Lee & Liu, 2003; Wickens et al., 1986). However, the data are often limited to a small number of maneuvers, where the airframes employed cannot be generalized to military rotary wing aircraft. A better understanding of aviators' perceived workload would benefit future research supporting Army Aviation.

Objectives

The primary objective of the study was to explore a new measure of workload assessment in an effort to move toward an operational definition of workload. Using this new workload assessment and definition, the present study characterized aviators' retrospective assessments of the workload involved in base and mission tasks related to the UH-60 A/L aircraft. A secondary objective was to examine the role of experience in workload assessments.

Methods

Participants

Eligible participants included UH-60 instructor pilots (IPs) or pilots enrolled in the UH-60 IP course at Fort Rucker. According to the local Aviation Training Brigade, there are approximately 100 UH-60 IPs stationed at Fort Rucker and all were encouraged to participate. In addition, students in the UH-60 instructor pilot course were also recruited. These class sizes vary from 10-20 students, and classes are offered every 2 weeks (J.R. Ramiccio, personal communication, January 29, 2009). During the data collection period, a total of 5 UH-60 IP courses were scheduled to be offered. Participants were recruited from those 5 classes.

Assessments

The Adam/Estrada (2003) workload assessment was updated to reflect the tasks in the most recent H-60 Series ATM (Department of the Army, 2007). A copy of the assessment is provided in Appendix A. The survey, along with instructions, was provided to eligible participants. Participants were asked to assess the cognitive, visual, aural, verbal, and physical demands of base and mission UH-60 ATM tasks on a 0 to 4 scale. As mentioned in the survey instructions, a rating of 0 indicates the domain was not demanded while performing the task, a rating of 1 indicates the domain was demanded up to a ¼ of the duration of the task, and a rating of 4 indicates the domain was demanded up to the full duration of the task. A total of 87 tasks were included. Participants were instructed to limit their assessments to the UH-60 A/L aircraft. It

should be noted that participants also had the option of not answering a question if they felt they did not have sufficient experience with a task. A demographic questionnaire was included in the survey packet that asked for information about the participants' flight experience. Data sheets were identified by a participant number rather than by name. The demographic questionnaire and the workload assessment were stapled together to ensure the two data sources could be linked to the same individual.

Design

It was hypothesized that instructor pilots, on average, would rate the workload of the UH-60 tasks lower than that of less experienced pilots. Therefore, the participants were categorized into different groups based on their flight experience. The present study utilized a quasi-experimental design, as assignment to the groups was not random.

Procedure

The study protocol was approved by the United States Army Medical Research and Materiel Command Human Subjects Research Review Board. After receiving approval of the aviation brigade and battalion Commanders, company Commanders were requested to distribute copies of the surveys to their IPs, and the directors of the instructor pilot course were asked to distribute the survey to their students. Participants were asked to complete the surveys on their own time, at their convenience, and to return all surveys to their Commander. The regimental secretary collected the surveys and a member of the research staff collected the surveys for data analysis at USAARL.

The present study received a waiver of informed consent documentation, citing 32 CFR 219 section 116 (Department of Defense, 2008). An information letter was included with the survey, which detailed the study purpose and rights of the participants. If a participant chose not to participate, she/he was instructed to return the survey packet to their Commander.

Results

Seventy-three completed surveys were collected during the data collection period. Five surveys were not included in data analysis as they were completed improperly. A total of 68 surveys were included in the analysis. All statistical analyses were conducted using SPSS® 13.0.

Demographic data

Study participants were classified into two groups depending on their flight experience: instructor pilots or students in the instructor pilot course. Demographic information is presented in table 1. All participants were male.

Table 1.
Study population demographics

	IPs	IP students	Total
n	46	22	68
Age	38.59 ± 7.7	34.09 ± 6.8	37.13 ±7.6
Flight Hours	3112.11 ± 2011.6	2717.05 ± 3381.1	2984.3 ± 2517.0

Overall results

The mean ratings for each task from all 68 participants are presented in Appendix B. It should be noted that while a total of 68 surveys were collected, participants had the option of not answering a question if they felt they did not have sufficient experience with a task. Therefore, not all task ratings are based on a sample size of 68, and this data is captured in Appendix B.

In terms of overall workload, the tasks with the highest ratings across the five domains include responding to emergencies, performing actions on contact, performing combat maneuvering, performing autorotation, and performing shipboard operations. The tasks with the lowest ratings across the five domains include operating aviation life support equipment, verifying aircraft weight and balance, operating storm scope weather mapping system, performing internal load operations, and preparing a performance planning card. Figures 1 and 2 presents the highest and lowest rated tasks (in order) by each domain. It should be noted that tasks were only included in these figures if at least 25% of the sample (17 pilots) rated a task. The distribution of ratings for the five highest and lowest rated tasks by domain are presented in Appendix C.

Mean workload ratings for all 87 tasks were aggregated across the five domains. As shown in table 2, the visual domain had the highest aggregate rating of the five domains, followed by the cognitive domain.

Table 2.
Aggregate workload ratings by domain

	Cognitive	Visual	Aural	Verbal	Physical
Aggregate rating	228.52	237.01	130.75	138.82	164.88

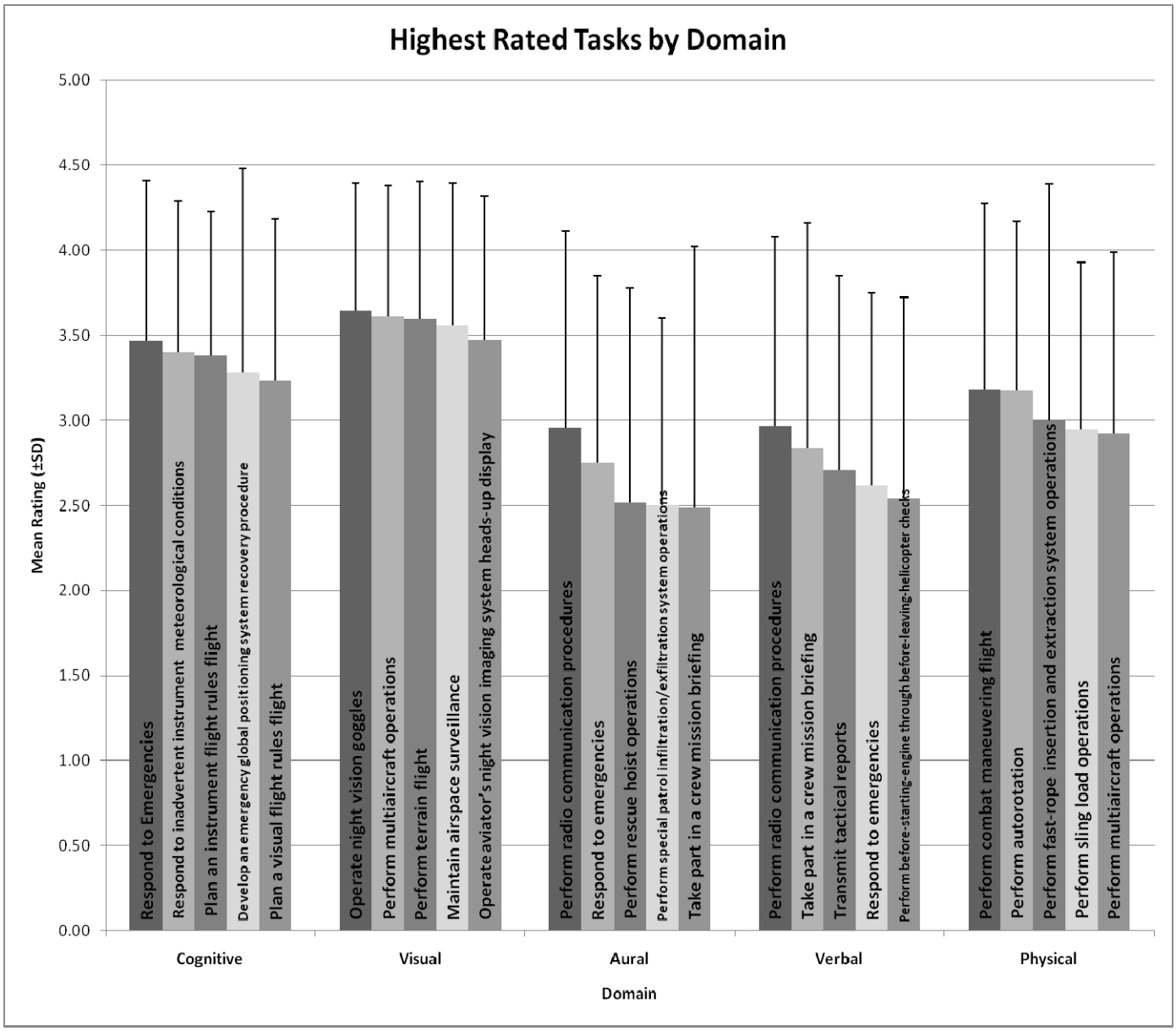

Figure 1. Mean ratings (±SD) of highest rated tasks by domain

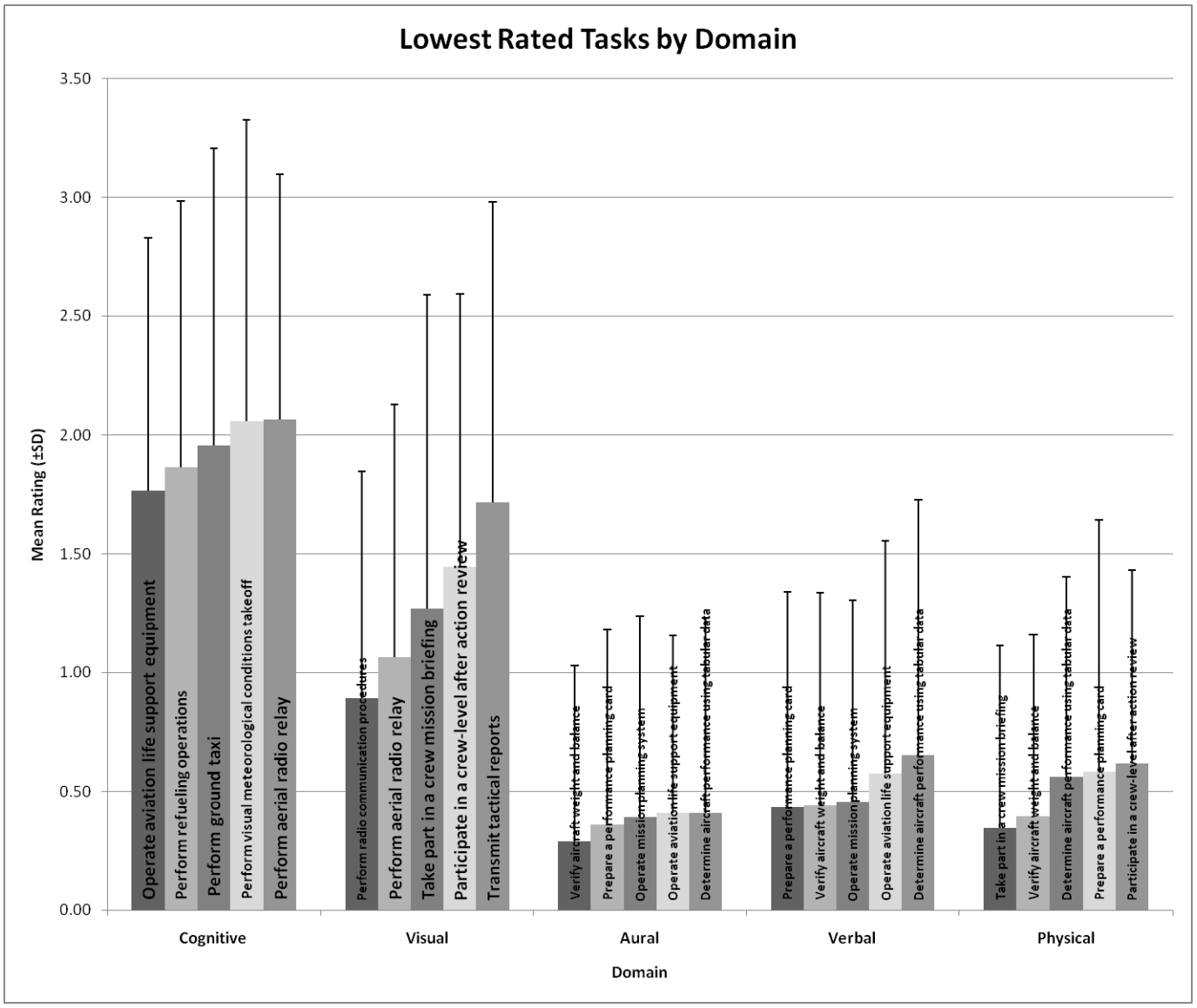

Figure 2. Mean ratings (±SD) of lowest rated tasks by domain

One of the objectives of the present study was to provide an operational definition of low, medium and high workload. The distribution of pilot ratings for all tasks within a domain were divided into three classes (low, moderate, and high workload) using the following formula:

$$\textit{class width} = \text{range} \div \text{number of classes}$$

The range of mean ratings (for all 87 tasks) varied according to domain; however, the number of classes was always 3 (low, moderate and high workload). These calculations yield a categorization schema with which to classify the tasks according to workload (table 3). The proposed schema provides an objective way to define workload based on a task's mean rating within a domain.

Table 3.
Workload categorization schema

Domain	Low	Moderate	High
Cognitive	1.76 – 2.33	2.34 – 2.90	2.91 – 3.47
Visual	0.89 – 1.81	1.82 – 2.73	2.74 - 3.65
Aural	0.29 – 1.18	1.19 - 2.07	2.08 -2.96
Verbal	0.43 – 1.28	1.29 – 2.12	2.13 – 2.97
Physical	0.34 – 1.29	1.30 – 2.23	2.24 - 3.18

Role of experience

A secondary objective of the present study was to examine the influence of flight experience on the workload ratings. The mean ratings for each task by experience are presented in Appendix D. In general, IP students reported slightly higher workload ratings than IPs, except with respect to the physical domain (table 4).

Table 4.
Aggregate workload ratings by domain and experience

Sample	Cognitive	Visual	Aural	Verbal	Physical
IPs	227.18	232.11	127.2	137.58	169.04
IP students	228.87	243.31	136.13	139.8	154.61

The data were further analyzed by correlating the participants' number of flight hours and their workload ratings. Table 5 presents the Pearson's correlation value (*r*) of those tasks that were significantly related to flight experience. In general, the relationship between flight hours and ratings was predominantly positive, indicating that as flight hours increased, the ratings increased, which was in disagreement with our hypothesis. There were instances where negative correlations were present (particularly for the aural and verbal domains), however they were not significant.

Table 5.
Significant correlations between task ratings and flight experience

Domain	Task	*r*
Cognitive		
	1032 Perform radio communication procedures	0.25
	1048 Perform fuel management procedures	0.26
	1174 Perform holding procedures	0.26
	1190 Perform hand and arm signals	0.35
	2066 Perform extended range fuel system operations	0.44
	2070 Perform M-139 Volcano operations	
	2076 Perform caving ladder operations	0.71

Visual		
	1000 Take part in a crew mission briefing	0.36
	1190 Perform hand and arm signals	0.27
	2048 Perform sling load operations	0.26
	2127 Perform combat maneuvering flight	0.30
	2169 Perform aerial observation	0.31
Aural		
	2061 Operate forward looking infrared system	0.84
	2063 Operate storm scope weather mapping system	0.80
	2066 Perform extended range fuel system operations	0.46
Verbal	2061 Operate forward looking infrared system	0.84
	2063 Operate storm scope weather mapping system	0.71
	2066 Perform extended range fuel system operations	0.49
	2076 Perform caving ladder operations	0.58
	2078 Perform helocast operations	0.62
Physical		
	1155 Negotiate wire obstacles	0.26
	1168 Perform command instrument system procedures	0.26
	1170 Perform instrument takeoff	0.28
	1174 Perform holding procedures	0.25
	1176 Perform nonprecision approach	0.28
	1178 Perform precision approach	0.27
	2056 Perform rappelling operations	0.34
	2064 Perform paradrop operations	0.44
	2078 Perform helocast operations	0.58
	2086 Operate aviator's night vision imaging system heads-up display	0.29

Discussion

It should be stressed that the present study is the first step in the assessment of this novel workload assessment tool. To test the validity, data obtained from using the new assessment need to be correlated with validated workload measures, both subjective and physiological. In addition, further studies are needed to test the assessment's reliability. However, the present study demonstrated that the present workload assessment was sensitive to various tasks and various workload dimensions.

The new workload assessment method differs from other subjective methods in that it is designed to be completed retrospectively after all tasks have been completed. Both the NASA TLX and the SWAT are designed to be administered immediately after each task. Tsang and Vidulich (1994) commented that delayed workload assessment techniques may promote "a more thorough comparison process" compared to immediate ratings. Also, the workload dimensions of

the new assessment differ in both construct and number from both the TLX (mental demand, physical demand, temporal demand, performance, effort, and frustration level) and the SWAT (time load, mental effort load, and psychological stress load). Finally, the present workload assessment uses absolute judgments, without consideration of other tasks.

The most immediate benefits of the present study would be as a useful resource for designing future protocols in support of Army Aviation utilizing the USAARL UH-60 aircraft and simulator. The proposed categorization schema allows for tasks to be categorized according to their mean ratings. For example, when designing a flight profile to evaluate a new communication or hearing protection device, an investigator can consult the results of the present study to help design a flight profile to include tasks that have been identified as aurally demanding.

The present study identified specific tasks that aviators perceive to be of high workload. Once specific tasks are identified, countermeasures can be developed to reduce workload, including new tactics, techniques, and procedures. For example, Horn, Bridges, and Lee (2006) modified the stability augmentation system (SAS) of a UH-60A aircraft for shipboard landings to reduce pilot workload. Shipboard operations were also identified as a high workload task by the present study. In addition, crew coordination could be enhanced during high workload tasks to distribute workload among the crew.

Overall, the visual and cognitive domains were the most heavily demanded of the five domains. The saturation of the visual sense is a well-known aviation problem (Bles, 2004). The present study supports the need for multi-modal information systems, such as 3D audio and the tactile displays, to divide information sensing and processing among multiple senses. Glumm, Kehring, and White (2007) examined the effects of multimodal information displays (i.e., visual + 3D audio, visual + tactile cues, etc.) on target localization and reported that multimodal displays reduced reaction times to cues.

Data from the present study could be used in conjunction with other workload analysis techniques. For example, Hart and Bortolussi (1984) proposed a workload assessment approach in which pilots rated the workload involved in various tasks under normal conditions and again under conditions in which the pilot made an error (e.g., selected wrong frequency). However, their assessment did not take into account the various dimensions of workload measured in the present study (i.e., visual, aural). Additionally, the error component of the Hart and Bortolussi method could be incorporated into the workload assessment used in the present study, where common errors are identified and then pilots are asked to rate how these errors change the workload ratings.

A secondary objective of the present study was to examine the differences in workload ratings between IPs and students in the IP course. As previously mentioned, research demonstrates a distinction between experts and novices with regard to the amount of resources a task demands. The present study found mixed results, with IP students reporting slightly higher aggregate ratings, but also demonstrated that the correlation between flight hours and workload ratings was generally positive, where ratings increased as flight experience increased. One explanation for the mixed results was the restricted experience of the study population. Students in the IP course

had a mean flight experience of 2717.05 hours, which is far removed from more novice pilots. Perhaps negative correlations would have been more prevalent if student pilots were part of the study population. It was a desire to capture data from true student pilots; however, most would have not experienced the advanced mission tasks in the ATM, and would most likely be unable to provide a rating for such tasks. Furthermore, there was an unequal sample size of IP students compared to IPs. An additional explanation for the differences in IP and IP student ratings may be due to the experience of teaching a task, rather than actually performing a task. Instructor pilots may have considered how hard it is to teach a specific task in their workload assessment in addition to the demands of performing the task themselves.

Additional applications

The results of this study also have applications for return-to-duty (RTD) assessments for H-60 model aviators. Army Regulation (AR) 40-501 (2008), chapter 4, outlines medical fitness for flying duty. This regulation and the U.S. Army Aeromedical Policy Letters (APLs) serve as guidance and implementing instructions for decisions regarding return to flying status.

In some instances, chronic illness or injury sequelae result in deficits that potentially impact an aviator's ability to safely and effectively operate the aircraft among the range of operational missions and flight profiles. In such cases, flight surgeons (FS), in conjunction with the US Army Aeromedical Activity (USAAMA), must determine the aviator's flight performance capabilities in light of these deficits before granting a waiver for return to flying duties. This will often include an in-flight evaluation with a FS and an IP as prescribed in AR 600-105, Aviation Service of Rated Army Officers (1994). In such cases, the FS is tasked with evaluation of the aviator's restrictions or deficits in consideration of in-flight workload requirements and psycho-physiologic stresses.

A validated, aircraft-specific workload metric, including assessments for each task of the ATM, would serve as an invaluable tool in designing a unique, case-specific in-flight aviator assessment. This allows the FS and the IP to design an evaluation profile that keys on high workload tasks corresponding with the aviator's deficits. An aviator with a history of a significant closed head injury may receive an evaluation that includes tasks rated as cognitively demanding, such as planning an instrument flight rules flight and responding to simulated inadvertent instrument meteorological conditions and emergencies. In addition, the evaluation for an aviator with visual deficits would include visually demanding tasks, including night vision goggles, multi-aircraft operations, and terrain flight, for example.

Furthermore, these workload assessments could be completed for ATM tasks for each aircraft type, further enhancing RTD applications. For example, one might conceive of cases whereby it is inappropriate to return an aviator to duty in an attack aircraft, but he may still remain safe and combat effective in a utility aircraft, salvaging the aviator's career and preserving a valued asset for the Army.

Limitations

The present study assessed perceived workload of UH-60 A/L tasks under optimal flight conditions, which limits the generalizability of the results. An attempt was made to collect data for the UH-60 M model, but only 2 surveys were returned and completed. Flight conditions such as poor weather (Wilson & Hankins, 1994) and time pressures (Lee & Liu, 2003) have been shown to increase a pilot's workload. Future research should examine perceived workload under less favorable conditions and for a variety of airframes. In addition, one drawback of the assessment is the time commitment necessary to complete the measure. A small amount of participants commented on the time involved to complete. The fatigue in completing the task may have resulted in order effects, with participants exerting less effort toward the end of the survey. Unfortunately, most comprehensive assessments often require a time commitment. Finally, as discussed in the introduction, there are limitations of retrospective workload assessments due to memory limitations. Future research should compare the results of the present study with assessments made immediately after performing a task.

Conclusion

The present study evaluated aviators' perceived workload regarding UH-60 A/L tasks. It represented the first step in the assessment of a new retrospective workload measure. Future research is needed to validate this new assessment method. However, the survey did demonstrate sensitivity by differentiating between high and low workload tasks. The identification of high workload tasks will allow for the development of countermeasures to reduce workload for specific tasks.

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Appendix A
Rating sheet and instructions

The following Workload Rating Scale asks for ratings of 5 types of workload that you may experience in flight tasks: cognitive, verbal, visual, auditory, and physical. Please rate each task on all 5 workload types based on your experience and evaluation of each task. **For any task for which you have no experience or feel your experience is too limited to rate, please enter N/A.**

Rating Scale: please enter one number in each of the rating sheet blocks

0 = No demand

1 = Factor demanded up to ¼ of the duration of the task

2 = Factor demanded from ¼ to ½ of the duration of the task

3 = Factor demanded from ½ to ¾ of the duration of the task

4 = Factor demanded from ¾ to full duration of the task

Optimal flight conditions: All tasks should be evaluated as if performed under optimal flight conditions. Optimal flight conditions are considered for these purposes to be standard day, clear, no winds, and with a fully functional co-pilot.

Definitions of workload types:

Visual – obtaining information through vision (e.g. scanning instruments, looking outside the cockpit, reading a map)

Aural – obtaining information through hearing (e.g. warning tones, communications from co-pilot or traffic controllers)

Physical – physical stress and coordination requirements, including movements (e.g. control inputs to cyclic or collective, pushing buttons or turning knobs)

Verbal – evaluating written or spoken textual material and producing speech (e.g. receiving or producing text messaging, listening to spoken messages, speaking to traffic controllers)

Cognitive – understanding information, evaluating situations, and decision making (e.g. flight planning, fuel calculations, and correlating performance parameters)

H-60A/L Rated Crew Member Task List

Participant Number_____

Please provide your honest assessment of the level of each type of demand for each task by entering a number in each block below. Please follow all instructions on the Instruction Sheet. Remember to limit your assessments to the UH-60 A/L aircraft. **For any task for which you have no experience or feel your experience is too limited to rate, please enter N/A.**

Task	Cognitive Demand	Visual Demand	Aural Demand	Verbal Demand	Physical Demand
1000 Take part in a crew mission briefing					
1004 Plan a visual flight rules flight					
1006 Plan an instrument flight rules flight					
1010 Prepare a performance planning card					
1011 Determine aircraft performance using tabular data					
1012 Verify aircraft weight and balance					
1013 Operate mission planning system					
1014 Operate aviation life support equipment					
1016 Perform internal load operations					
1020 Prepare aircraft or mission					
1022 Perform preflight inspection					
1024 Perform before-starting-engine through before-leaving-helicopter checks					
1026 Maintain airspace surveillance					
1028 Perform hover power check					
1032 Perform radio communication procedures					
1034 Perform ground taxi					
1038 Perform hovering flight					
1040 Perform visual meteorological conditions takeoff					
1044 Navigate by pilotage and dead reckoning					
1046 Perform electronically aided navigation					
1048 Perform fuel management procedures					
1052 Perform visual meteorological conditions flight maneuvers					
1054 Select landing zone/pickup zone/holding area					
1058 Perform visual meteorological conditions approach					
1062 Perform slope operations					
1064 Perform a roll-on landing					
1068 Perform go-around					
1070 Respond to emergencies					
1082 Perform autorotation					
1114 Perform a rolling takeoff					
1142 Perform digital communications					
1155 Negotiate wire obstacles					
1162 Perform emergency egress					
1166 Perform instrument maneuvers					
1168 Perform command instrument system procedures					

Task	Cognitive Demand	Visual Demand	Aural Demand	Verbal Demand	Physical Demand
1170 Perform instrument takeoff					
1174 Perform holding procedures					
1176 Perform nonprecision approach					
1178 Perform precision approach					
1180 Perform emergency global positioning system recovery procedure					
1182 Perform unusual attitude recovery					
1184 Respond to inadvertent instrument meteorological conditions					
1188 Operate aircraft survivability equipment					
1190 Perform hand and arm signals					
1194 Perform refueling operations					
1253 Operate flight management system/central display unit					
1254 Operate multifunction display					
1262 Participate in a crew-level after action review					
2010 Perform multiaircraft operations					
2012 Perform tactical flight mission planning					
2014 Perform electronic countermeasures/electronic counter-countermeasures procedures					
2022 Transmit tactical reports					
2024 Perform terrain flight navigation					
2026 Perform terrain flight					
2034 Perform masking and unmasking					
2036 Perform terrain flight deceleration					
2042 Perform actions on contact					
2048 Perform sling load operations					
2050 Develop an emergency global positioning system recovery procedure					
2052 Perform water bucket operations					
2054 Perform fast-rope insertion and extraction system operations					
2056 Perform rappelling operations					
2058 Perform special patrol infiltration/exfiltration system operations					
2060 Perform rescue hoist operations					
2061 Operate forward looking infrared system					
2063 Operate storm scope weather mapping system					
2064 Perform paradrop operations					
2065 Operate personnel locater system					
2066 Perform extended range fuel system operations					
2068 Perform shipboard operations					
2070 Perform M-139 Volcano operations					
2075 Perform fat hawk operations					
2076 Perform caving ladder operations					
2078 Perform helocast operations					
2081 Operate night vision goggles					
2086 Operate aviator’s night vision imaging system heads-up display					

Task	Cognitive Demand	Visual Demand	Aural Demand	Verbal Demand	Physical Demand
2090 Perform landing area reconnaissance for simulated maximum gross weight					
2092 Respond to night vision goggles failure					
2093 Perform simulated maximum gross weight approach and landing					
2095 Perform simulated maximum gross weight takeoff					
2098 Perform aerial radio relay					
2112 Operate armament subsystem					
2116 Perform an aerial radiological survey					
2120 Provide patient treatment at emergency medical-technician—basic, intermediate, or paramedic—level					
2122 Perform advanced cardiac life support					
2127 Perform combat maneuvering flight					
2169 Perform aerial observation					

Please provide any additional comments

Demographics Questionnaire

Participant Number _____

Please provide the following information regarding your aviation experience. All responses are completely anonymous and confidential and at no time will your responses be connected to you as an individual. The data collected will be used for research purposes only. Do not separate this sheet from the attached rating sheet and instructions.

Please answer the following:

1. Age:_____ 2. Sex (circle 1): Male Female

3. Rank:_____ 4. Unit:_____

5. Date of Flight School Graduation (month/year):_____

6. Total # of Flight Hours: _____ 7. Total # of Simulator Hours:_____

8. Total # of Military Flight Hours: FW: _____ RW:_____

9. Total # of Civilian Flight Hours: FW:_____ RW:_____

10. How many hours did you fly the UH-60 in the past 30 days?_____

11. How many UH-60 simulator hours have you flown in the past 30 days?_____

12. Please list all type and model aircraft in which you are qualified:

13. Please circle all types of mission experience that you have had:

Observation/Scout Attack Transport Medevac

Search and Rescue External cargo Drug Interdiction

Other_____

Please circle the most accurate responses for the following questions:

14. Which term best identifies your current job position or title? *circle only 1*

Instructor Pilot	Training to become an Instructor Pilot

15. What is your current Flight Activity Category (FAC) designation?

1 2 3 NA

16. What is your current Readiness Level (RL)?

1 2 3 NA

Appendix B

Mean ratings by domain (mean, standard deviation (*SD*) and sample size (*n*) reported)

Task	Domain														
	Cognitive			**Visual**			**Aural**			**Verbal**			**Physical**		
	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*
1000 Take part in a crew mission briefing	2.73	1.31	67	1.27	1.32	67	2.49	1.54	68	2.84	1.32	68	0.34	0.77	67
1004 Plan a visual flight rules flight	3.24	0.95	68	2.19	1.35	68	0.49	0.89	67	0.79	1.18	68	0.64	1.04	67
1006 Plan an instrument flight rules flight	3.38	0.85	68	2.25	1.36	68	0.48	0.89	67	0.78	1.14	68	0.63	0.97	67
1010 Prepare a performance planning card	3.22	1.03	68	2.19	1.36	68	0.36	0.85	67	0.43	0.91	67	0.58	1.06	67
1011 Determine aircraft performance using tabular data	3.15	1.08	67	2.30	1.41	67	0.41	0.82	66	0.65	1.07	66	0.56	0.84	66
1012 Verify aircraft weight and balance	2.46	1.21	68	2.04	1.38	68	0.29	0.74	66	0.44	0.90	66	0.39	0.76	66
1013 Operate mission planning system	3.07	0.97	67	2.52	1.30	67	0.39	0.85	64	0.45	0.85	64	0.69	1.06	65
1014 Operate aviation life support equipment	1.76	1.07	68	1.74	1.19	68	0.41	0.74	66	0.58	0.98	66	1.10	0.94	67
1016 Perform internal load operations	2.14	1.11	66	1.76	1.10	66	0.53	0.93	64	0.72	1.02	65	1.61	1.28	66
1020 Prepare aircraft or mission	2.21	1.14	66	2.29	1.31	66	0.66	1.02	65	1.06	1.17	65	2.00	1.16	66
1022 Perform preflight inspection	2.32	1.23	66	3.09	1.21	66	0.83	1.13	65	1.12	1.11	65	2.61	1.18	66
1024 Perform before-starting-engine through before-leaving-helicopter checks	2.87	1.12	68	2.93	1.07	68	2.38	1.21	68	2.54	1.18	68	1.74	1.14	68
1026 Maintain airspace surveillance	2.16	1.34	67	3.56	0.84	68	1.94	1.30	66	1.96	1.20	67	1.18	1.20	66
1028 Perform hover power check	2.10	1.19	68	2.27	1.12	67	1.26	0.93	66	1.38	1.00	66	1.74	1.33	65
1032 Perform radio communication procedures	2.31	1.20	67	0.89	0.95	65	2.96	1.16	67	2.97	1.11	66	0.88	0.98	64
1034 Perform ground taxi	1.96	1.25	67	2.65	1.14	68	1.09	1.00	65	1.04	0.84	67	2.22	1.22	67
1038 Perform hovering flight	2.12	1.25	67	2.87	1.09	68	1.23	1.06	66	1.16	0.96	67	2.47	1.13	68
1040 Perform visual meteorological conditions takeoff	2.06	1.27	67	2.97	1.08	68	1.21	0.95	66	1.21	0.88	67	2.43	1.21	68

Task	Domain														
	Cognitive			**Visual**			**Aural**			**Verbal**			**Physical**		
	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*
1044 Navigate by pilotage and dead reckoning	2.90	1.12	67	3.19	0.93	67	1.58	1.16	66	2.06	1.07	67	1.69	1.21	65
1046 Perform electronically aided navigation	2.57	1.06	67	2.78	0.98	67	1.47	1.14	66	1.67	1.04	66	1.45	1.24	65
1048 Perform fuel management procedures	2.35	1.17	68	1.97	1.06	67	0.97	1.00	67	1.15	0.91	67	0.89	0.94	65
1052 Perform visual meteorological conditions flight maneuvers	2.42	1.18	67	3.03	1.10	67	1.29	1.05	66	1.41	0.98	66	2.39	1.18	67
1054 Select landing zone/pickup zone/holding area	2.58	1.15	64	3.03	1.05	64	1.14	1.06	63	1.37	1.02	63	1.31	1.20	61
1058 Perform visual meteorological conditions approach	2.40	1.24	68	3.03	1.09	68	1.31	1.05	67	1.37	0.97	67	2.43	1.20	68
1062 Perform slope operations	2.81	1.09	67	3.19	1.00	67	1.45	1.15	67	1.66	1.02	67	2.85	1.09	67
1064 Perform a roll-on landing	2.65	1.19	68	3.21	1.01	67	1.34	1.12	67	1.49	1.05	67	2.87	0.95	67
1068 Perform go-around	2.56	1.24	68	2.85	1.24	68	1.51	1.13	67	1.59	1.03	68	2.22	1.16	68
1070 Respond to emergencies	3.47	0.94	68	3.12	1.02	68	2.75	1.10	68	2.62	1.13	68	2.65	1.10	68
1082 Perform autorotation	3.13	1.12	68	3.41	0.93	68	2.07	1.18	68	2.07	1.14	68	3.18	0.99	68
1114 Perform a rolling takeoff	2.76	1.22	67	3.15	1.13	67	1.43	1.06	67	1.63	1.01	67	2.82	1.11	67
1142 Perform digital communications	2.21	1.14	42	2.15	1.14	40	1.78	1.33	40	1.50	1.28	40	1.17	1.19	42
1155 Negotiate wire obstacles	2.28	1.15	67	3.30	1.03	67	1.35	1.13	66	1.50	0.96	66	1.82	1.19	67
1162 Perform emergency egress	2.24	1.10	67	2.28	1.15	67	1.61	1.27	67	1.87	1.32	67	2.79	1.26	66
1166 Perform instrument maneuvers	3.15	1.07	68	3.21	0.96	67	1.93	1.34	67	1.99	1.21	67	2.40	1.05	68
1168 Perform command instrument system procedures	2.82	0.91	68	2.81	1.08	68	1.18	1.10	67	1.45	1.06	67	1.47	1.04	68
1170 Perform instrument takeoff	2.87	1.06	67	3.23	0.97	66	1.49	0.99	65	1.52	0.89	65	2.35	1.27	66
1174 Perform holding procedures	3.13	0.83	67	2.91	1.11	66	1.55	1.00	65	1.52	0.87	65	2.06	1.29	66
1176 Perform nonprecision approach	3.07	0.97	67	3.02	1.09	66	1.58	0.98	65	1.58	0.86	65	2.05	1.33	66
1178 Perform precision approach	3.04	0.98	67	3.03	1.07	66	1.65	1.04	65	1.55	0.88	65	2.08	1.33	66

Task	Domain														
	Cognitive			**Visual**			**Aural**			**Verbal**			**Physical**		
	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*
1180 Perform emergency global positioning system recovery procedure	3.12	0.93	65	3.00	1.06	63	1.58	1.11	62	1.61	1.00	62	2.00	1.31	62
1182 Perform unusual attitude recovery	3.01	1.09	67	3.39	0.97	66	1.51	1.15	65	1.69	1.03	65	2.65	1.26	65
1184 Respond to inadvertent instrument meteorological conditions	3.40	0.89	67	3.41	1.02	66	1.95	1.22	66	2.20	1.03	66	2.79	1.25	66
1188 Operate aircraft survivability equipment	2.12	1.09	67	1.94	1.09	65	1.37	1.02	65	1.25	0.92	65	1.31	1.17	64
1190 Perform hand and arm signals	2.10	1.12	60	2.71	1.32	58	0.63	0.84	57	0.84	1.03	57	1.58	1.27	57
1194 Perform refueling operations	1.86	1.12	66	2.11	1.15	65	1.23	1.09	65	1.34	0.97	65	1.06	1.01	64
1253 Operate flight management system/central display unit	2.29	1.59	21	2.68	1.43	22	0.82	1.01	22	1.00	1.07	22	1.27	1.35	22
1254 Operate multifunction display	2.16	1.50	19	2.74	1.56	19	0.67	1.14	18	0.94	1.21	18	1.00	1.08	18
1262 Participate in a crew-level after action review	2.45	1.19	66	1.45	1.15	65	2.40	1.39	65	2.54	1.25	65	0.62	0.81	63
2010 Perform multiaircraft operations	3.00	0.94	66	3.62	0.76	65	1.92	1.27	65	2.06	1.00	65	2.92	1.07	65
2012 Perform tactical flight mission planning	3.18	1.04	66	2.72	1.08	65	1.02	0.99	65	1.25	1.02	65	1.03	1.04	64
2014 Perform electronic countermeasures/electronic counter-countermeasures procedures	2.34	1.15	47	2.23	1.13	47	1.48	1.05	46	1.43	0.93	46	1.11	0.96	45
2022 Transmit tactical reports	2.40	1.11	62	1.72	1.26	60	1.95	1.26	61	2.70	1.15	61	0.81	0.92	59
2024 Perform terrain flight navigation	3.15	0.92	66	3.45	0.85	65	1.67	1.10	64	1.95	1.05	65	1.81	1.37	64
2026 Perform terrain flight	2.92	1.00	66	3.60	0.81	65	1.58	1.05	64	1.66	1.00	65	2.71	1.33	65
2034 Perform masking and unmasking	2.47	1.06	66	3.25	0.98	65	1.58	1.01	65	1.75	0.97	65	2.37	1.27	65
2036 Perform terrain flight deceleration	2.48	1.08	66	3.08	1.08	65	1.53	1.13	64	1.53	0.98	64	2.48	1.17	64

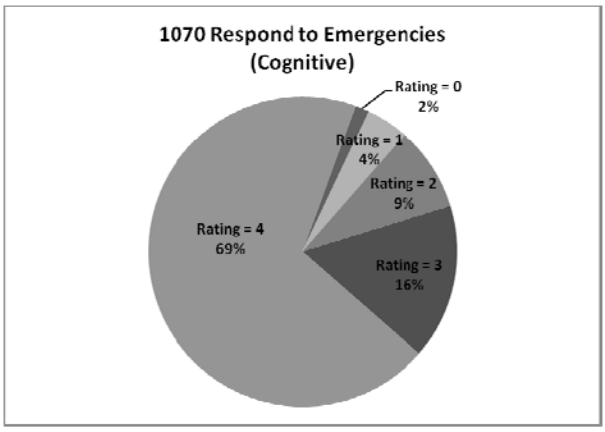
Task	Domain														
	Cognitive			**Visual**			**Aural**			**Verbal**			**Physical**		
	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*
2042 Perform actions on contact	2.94	1.02	66	3.25	1.09	65	2.37	1.28	65	2.45	1.21	65	2.92	1.18	65
2048 Perform sling load operations	2.92	1.05	61	3.10	1.02	60	2.22	1.18	60	2.13	1.02	60	2.95	0.98	60
2050 Develop an emergency global positioning system recovery procedure	3.28	1.20	32	2.52	1.31	31	0.77	0.84	31	0.87	0.92	31	1.00	1.15	31
2052 Perform water bucket operations	2.92	1.26	38	2.95	1.22	37	2.14	1.27	37	2.03	1.01	37	2.73	1.33	37
2054 Perform fast-rope insertion and extraction system operations	3.00	1.20	29	3.21	0.99	28	2.32	1.19	28	2.14	1.08	28	3.00	1.39	28
2056 Perform rappelling operations	2.97	1.17	37	3.19	1.01	36	2.39	1.15	36	2.19	1.09	36	2.83	1.25	36
2058 Perform special patrol infiltration/exfiltration system operations	2.91	1.38	23	3.22	1.13	23	2.50	1.10	22	2.32	1.13	22	2.76	1.48	21
2060 Perform rescue hoist operations	2.81	1.26	32	3.19	1.11	31	2.52	1.26	31	2.29	1.19	31	2.84	1.27	31
2061 Operate forward looking infrared system	1.89	1.36	9	2.75	1.49	8	0.75	0.89	8	0.75	0.89	8	1.00	1.41	8
2063 Operate storm scope weather mapping system	2.07	1.27	14	2.54	1.39	13	0.54	0.78	13	0.69	0.75	13	0.46	0.66	13
2064 Perform paradrop operations	2.53	1.22	30	2.55	1.30	29	1.93	1.03	29	1.90	0.90	29	2.31	1.34	29
2065 Operate personnel locater system	2.43	1.21	21	2.45	1.32	20	1.80	1.01	20	1.45	0.94	20	1.10	1.12	20
2066 Perform extended range fuel system operations	2.50	1.05	34	2.30	1.13	33	1.03	0.85	33	1.30	0.81	33	1.27	0.91	33
2068 Perform shipboard operations	2.88	1.54	17	3.25	1.34	16	2.31	1.40	16	2.33	1.18	15	3.06	1.44	16
2070 Perform M-139 Volcano operations	2.00	1.50	9	2.50	1.51	8	1.75	1.39	8	1.88	1.25	8	2.00	1.77	8
2075 Perform fat hawk operations	2.08	1.56	12	1.64	1.43	11	1.27	1.19	11	1.27	0.90	11	1.27	1.42	11
2076 Perform caving ladder operations	2.36	1.45	14	3.00	1.35	13	2.38	1.39	13	1.92	1.19	13	2.69	1.55	13
2078 Perform helocast operations	2.50	1.41	16	2.87	1.51	15	2.33	1.35	15	2.13	1.25	15	2.47	1.46	15

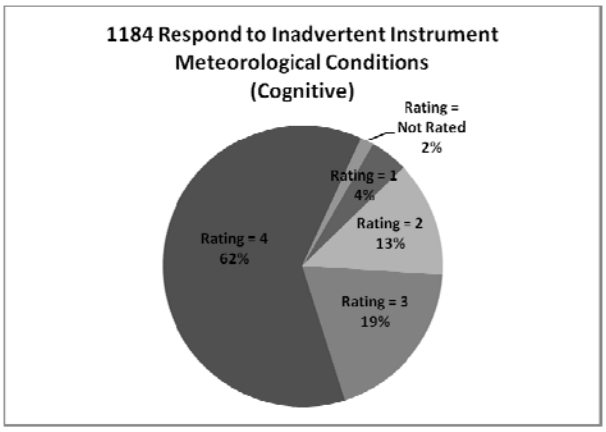
Task	Domain														
	Cognitive			**Visual**			**Aural**			**Verbal**			**Physical**		
	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*	mean	*SD*	*n*
2081 Operate night vision goggles	2.73	1.25	64	3.65	0.75	62	1.31	1.34	61	1.44	1.31	61	2.44	1.38	61
2086 Operate aviator's night vision imaging system heads-up display	2.74	1.16	58	3.47	0.85	57	1.21	1.20	56	1.29	1.14	56	2.02	1.53	56
2090 Perform landing area reconnaissance for simulated maximum gross weight	2.94	1.07	54	3.06	1.02	54	1.40	1.08	53	1.62	0.84	53	1.98	1.31	53
2092 Respond to night vision goggles failure	2.49	1.13	65	2.60	1.43	65	1.45	1.21	64	1.88	1.06	64	1.84	1.25	63
2093 Perform simulated maximum gross weight approach and landing	3.16	0.93	58	2.93	1.03	57	1.53	1.15	57	1.82	0.97	56	2.62	1.30	58
2095 Perform simulated maximum gross weight takeoff	3.03	1.02	59	2.86	1.01	59	1.61	1.13	59	1.79	0.91	58	2.56	1.28	59
2098 Perform aerial radio relay	2.06	1.03	31	1.06	1.06	31	2.03	1.22	31	2.03	1.22	31	1.03	0.91	31
2112 Operate armament subsystem	2.20	1.40	10	2.50	1.78	10	1.44	1.01	9	1.44	1.13	9	1.67	1.32	9
2116 Perform an aerial radiological survey	2.17	1.60	6	2.50	1.76	6	1.67	1.63	6	1.33	1.21	6	1.33	1.21	6
2120 Provide patient treatment at emergency medical-technician—basic, intermediate, or paramedic—level	2.50	1.51	10	2.30	1.70	10	1.80	1.55	10	1.80	1.03	10	2.70	1.42	10
2122 Perform advanced cardiac life support	2.50	1.51	8	2.13	1.46	8	1.75	1.39	8	2.00	1.07	8	2.75	1.58	8
2127 Perform combat maneuvering flight	3.22	0.98	49	3.41	0.84	49	1.98	1.20	49	2.12	1.13	49	3.18	1.09	49
2169 Perform aerial observation	2.67	1.25	43	3.28	1.08	43	1.52	0.99	42	1.79	1.01	43	1.83	1.27	42

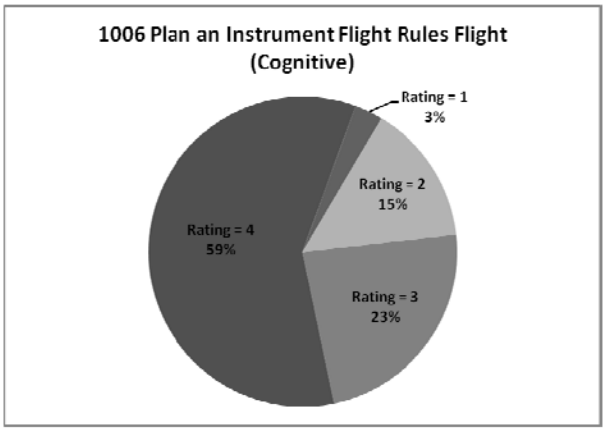
Appendix C

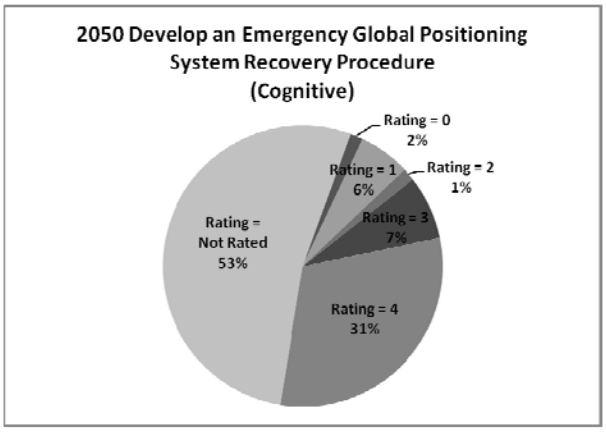
Distribution of ratings for the five highest and lowest rated tasks by domain

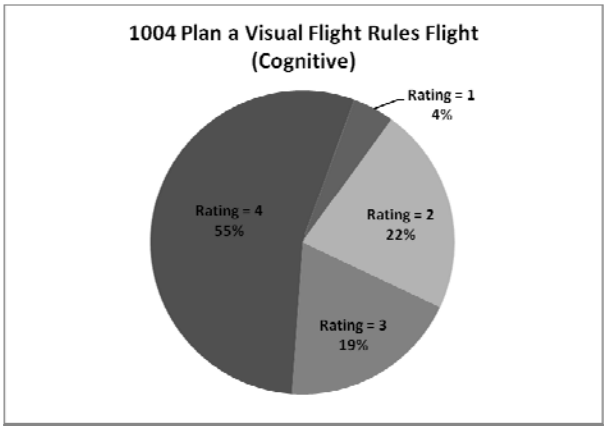
High workload

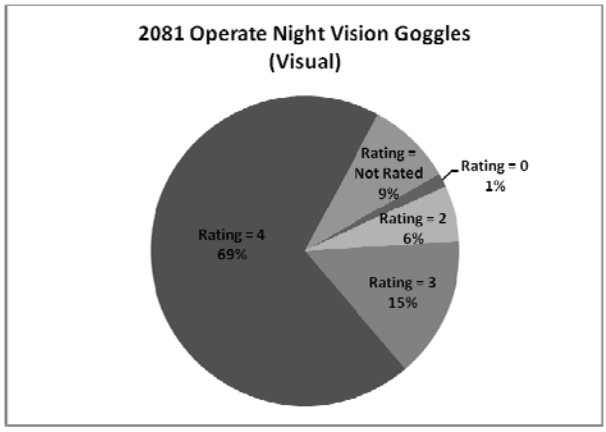


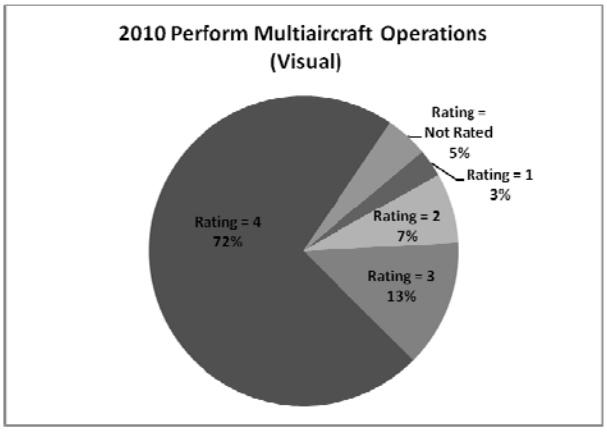


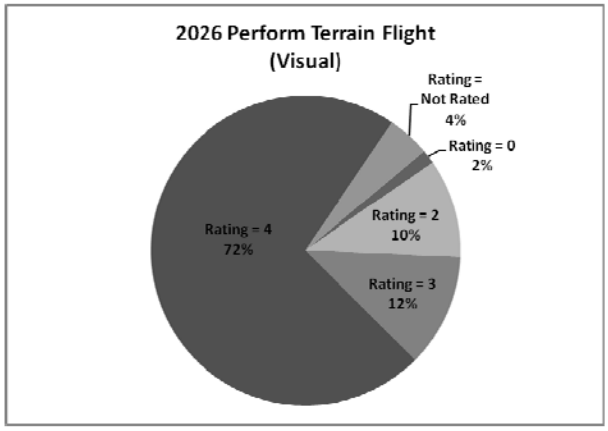


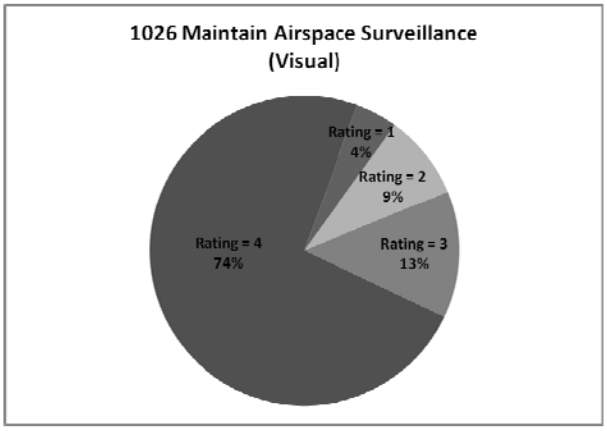


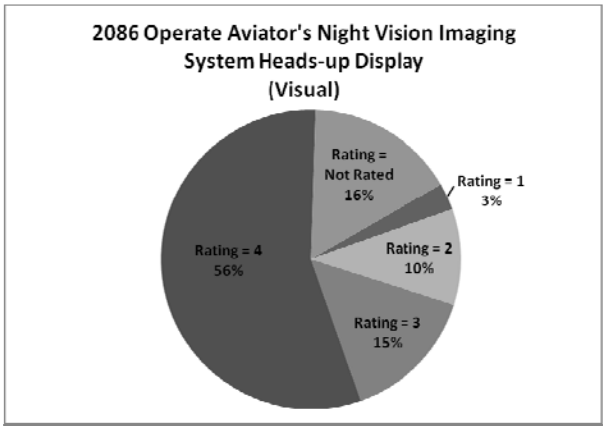


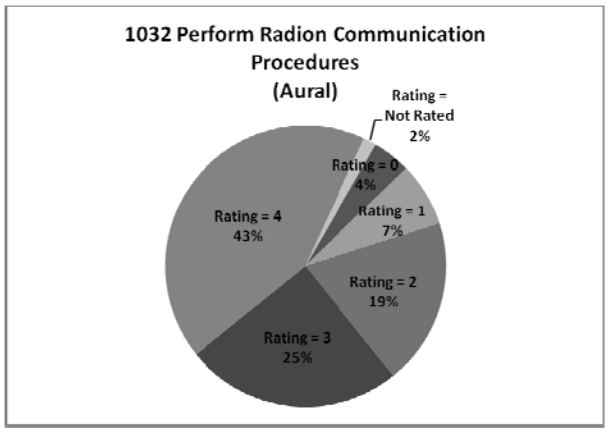

2081 Operate Night Vision Goggles
(Visual)
Rating = Not Rated 9%
Rating = 0 1%
Rating = 2 6%
Rating = 3 15%
Rating = 4 69%

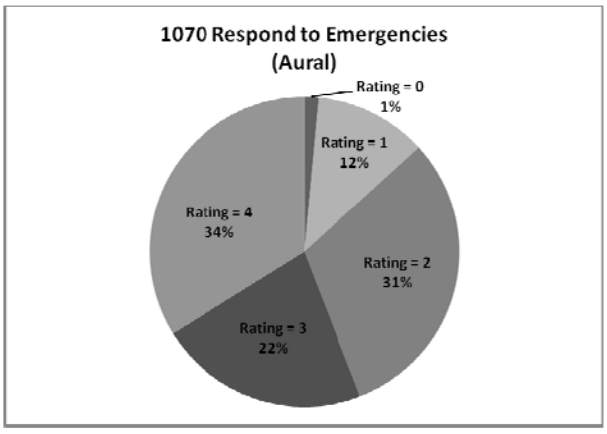

2010 Perform Multiaircraft Operations
(Visual)
Rating = Not Rated 5%
Rating = 1 3%
Rating = 2 7%
Rating = 3 13%
Rating = 4 72%

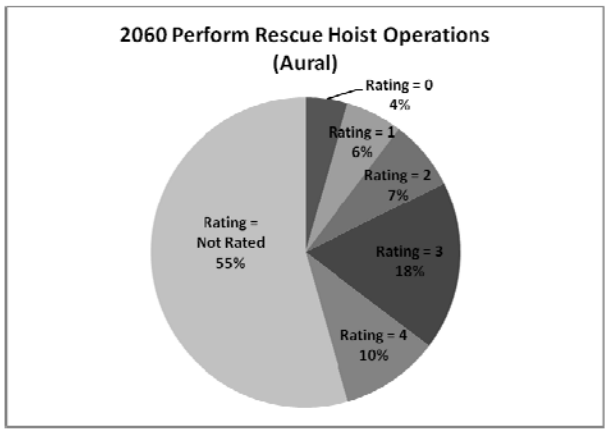

2026 Perform Terrain Flight
(Visual)
Rating = Not Rated 4%
Rating = 0 2%
Rating = 2 10%
Rating = 3 12%
Rating = 4 72%

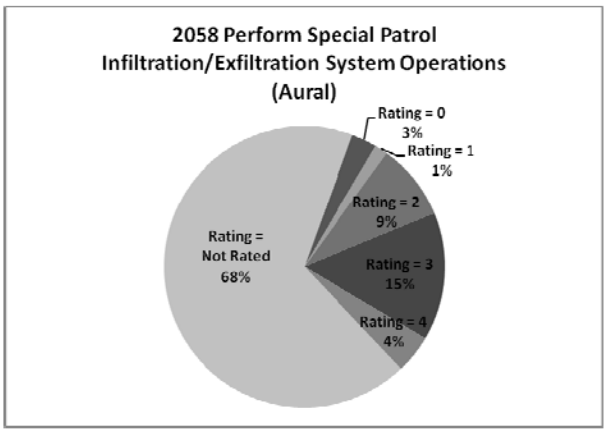

1026 Maintain Airspace Surveillance
(Visual)
Rating = 1 4%
Rating = 2 9%
Rating = 3 13%
Rating = 4 74%

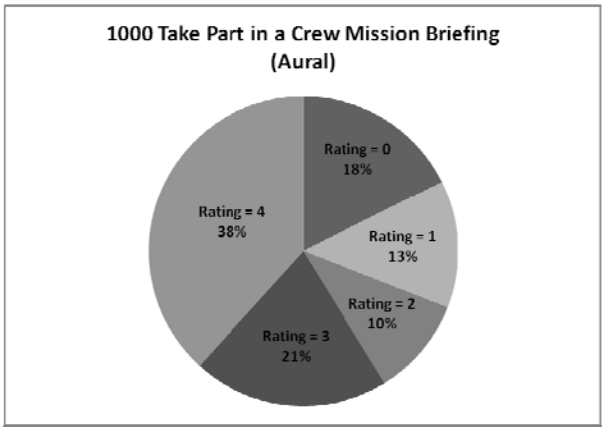

2086 Operate Aviator's Night Vision Imaging System Heads-up Display
(Visual)
Rating = Not Rated 16%
Rating = 1 3%
Rating = 2 10%
Rating = 3 15%
Rating = 4 56%

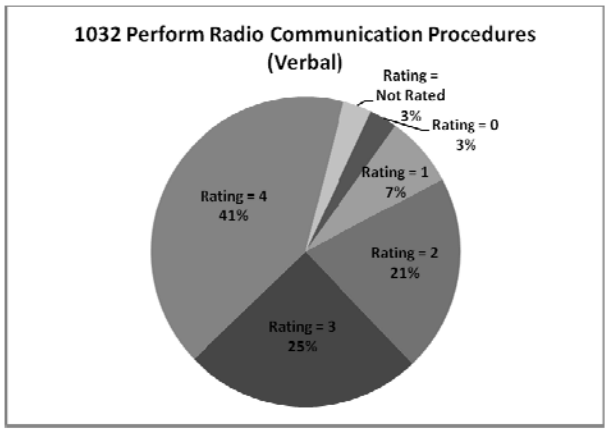

1032 Perform Radion Communication Procedures (Aural)
Rating = Not Rated 2%
Rating = 0 4%
Rating = 1 7%
Rating = 2 19%
Rating = 3 25%
Rating = 4 43%

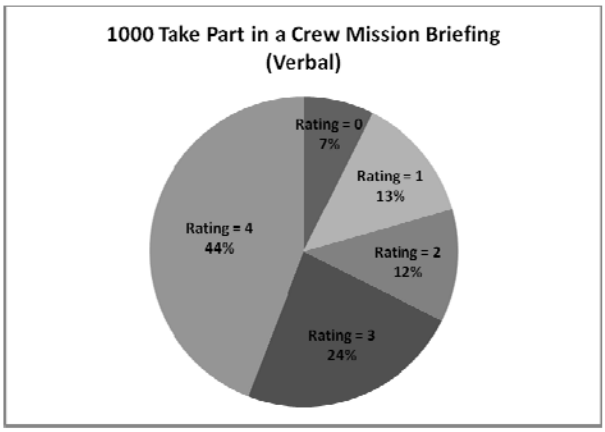

1070 Respond to Emergencies (Aural)
Rating = 0 1%
Rating = 1 12%
Rating = 2 31%
Rating = 3 22%
Rating = 4 34%

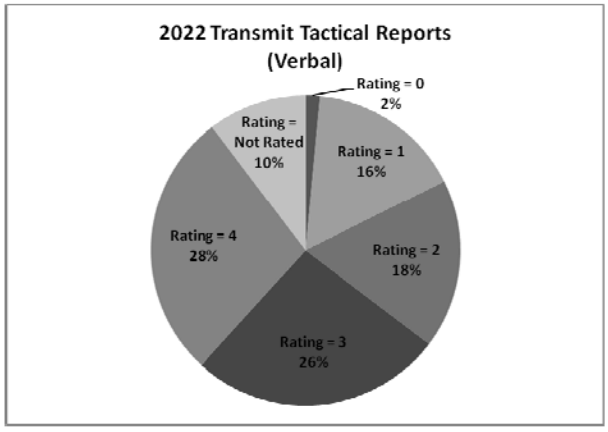

2060 Perform Rescue Hoist Operations (Aural)
Rating = 0 4%
Rating = 1 6%
Rating = 2 7%
Rating = 3 18%
Rating = 4 10%
Rating = Not Rated 55%

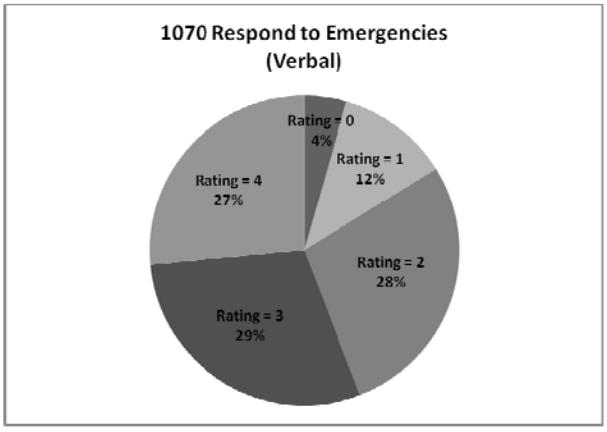

2058 Perform Special Patrol Infiltration/Exfiltration System Operations (Aural)
Rating = 0 3%
Rating = 1 1%
Rating = 2 9%
Rating = 3 15%
Rating = 4 4%
Rating = Not Rated 68%

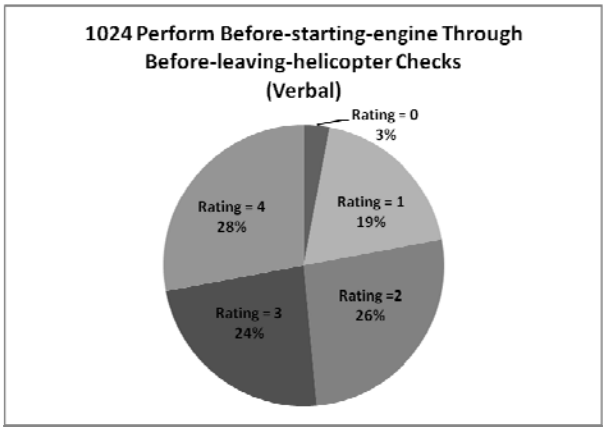

1000 Take Part in a Crew Mission Briefing (Aural)
Rating = 0 18%
Rating = 1 13%
Rating = 2 10%
Rating = 3 21%
Rating = 4 38%

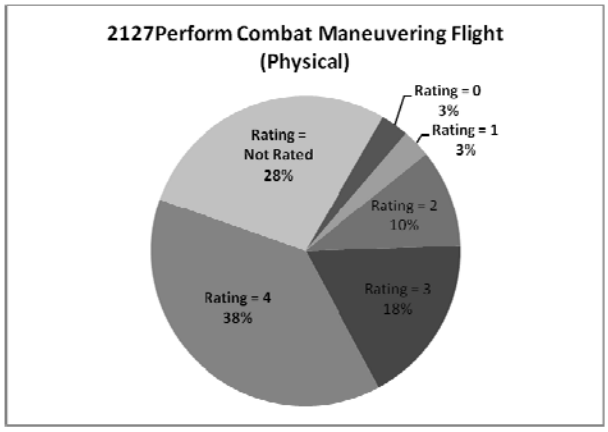

1032 Perform Radio Communication Procedures
(Verbal)
Rating = Not Rated 3%
Rating = 0 3%
Rating = 1 7%
Rating = 2 21%
Rating = 3 25%
Rating = 4 41%

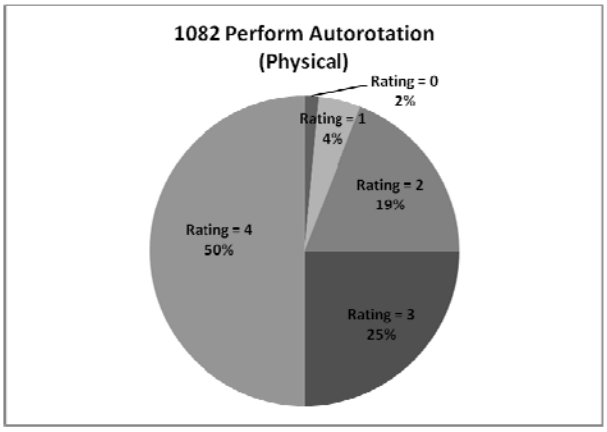

1000 Take Part in a Crew Mission Briefing
(Verbal)
Rating = 0 7%
Rating = 1 13%
Rating = 2 12%
Rating = 3 24%
Rating = 4 44%

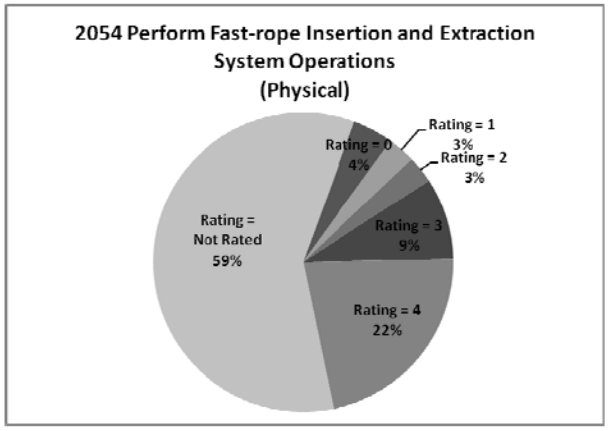

2022 Transmit Tactical Reports
(Verbal)
Rating = 0 2%
Rating = 1 16%
Rating = 2 18%
Rating = 3 26%
Rating = 4 28%
Rating = Not Rated 10%

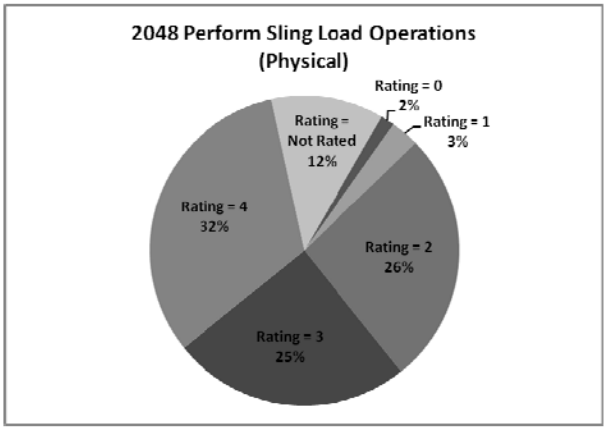

1070 Respond to Emergencies
(Verbal)
Rating = 0 4%
Rating = 1 12%
Rating = 2 28%
Rating = 3 29%
Rating = 4 27%

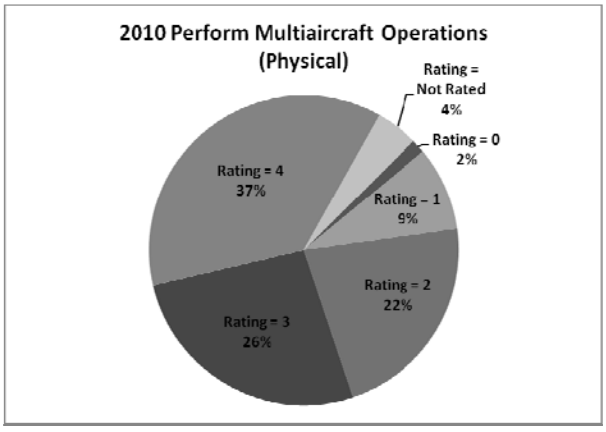

1024 Perform Before-starting-engine Through Before-leaving-helicopter Checks
(Verbal)
Rating = 0 3%
Rating = 1 19%
Rating =2 26%
Rating = 3 24%
Rating = 4 28%


2127Perform Combat Maneuvering Flight
(Physical)
Rating = 0
3%
Rating = 1
3%
Rating = 2
10%
Rating = 3
18%
Rating = 4
38%
Rating =
Not Rated
28%

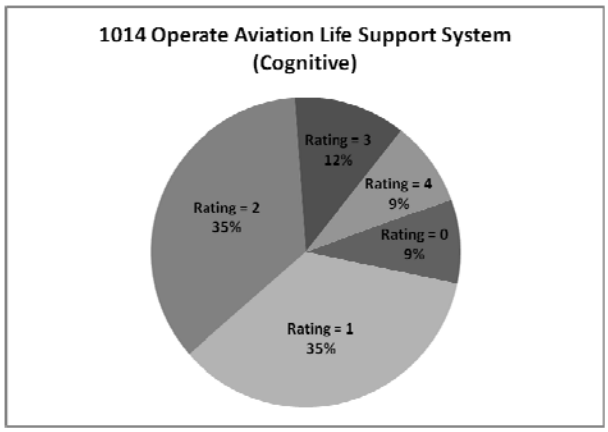

1082 Perform Autorotation
(Physical)
Rating = 0
2%
Rating = 1
4%
Rating = 2
19%
Rating = 3
25%
Rating = 4
50%

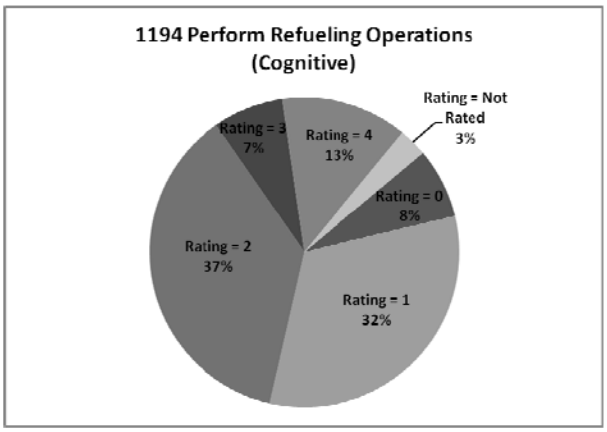

2054 Perform Fast-rope Insertion and Extraction
System Operations
(Physical)
Rating = 0
4%
Rating = 1
3%
Rating = 2
3%
Rating = 3
9%
Rating = 4
22%
Rating =
Not Rated
59%

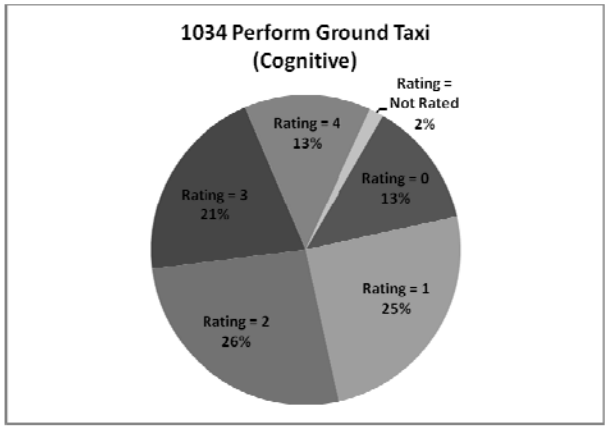

2048 Perform Sling Load Operations
(Physical)
Rating = 0
2%
Rating = 1
3%
Rating = 2
26%
Rating = 3
25%
Rating = 4
32%
Rating =
Not Rated
12%

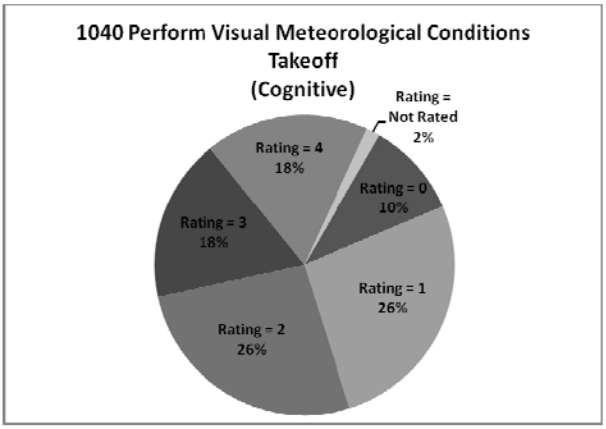

2010 Perform Multiaircraft Operations
(Physical)
Rating =
Not Rated
4%
Rating = 0
2%
Rating – 1
9%
Rating = 2
22%
Rating = 3
26%
Rating = 4
37%

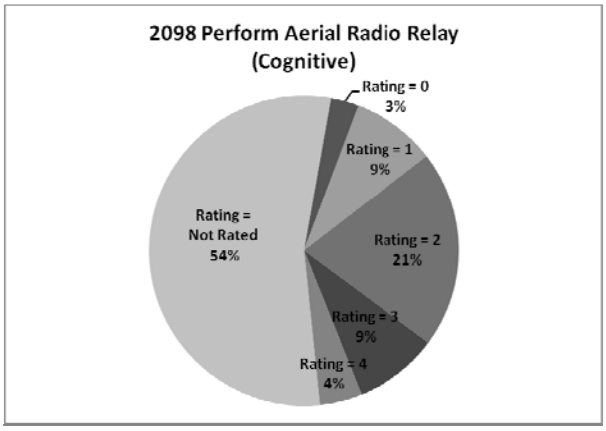
Low Workload

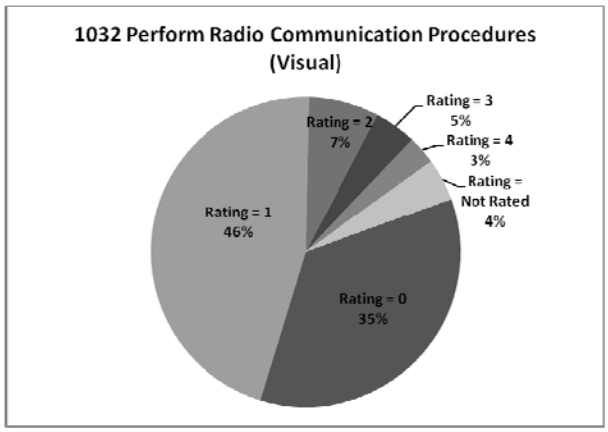


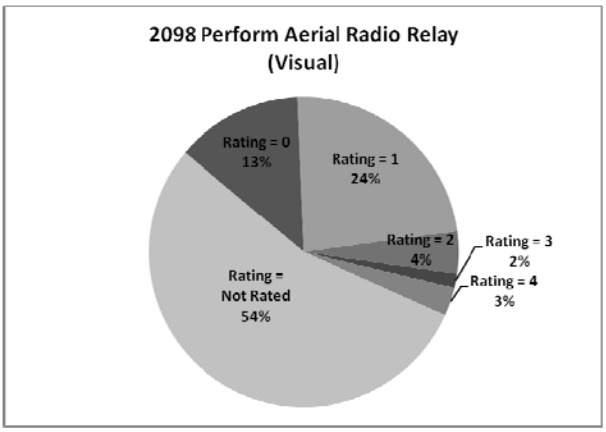


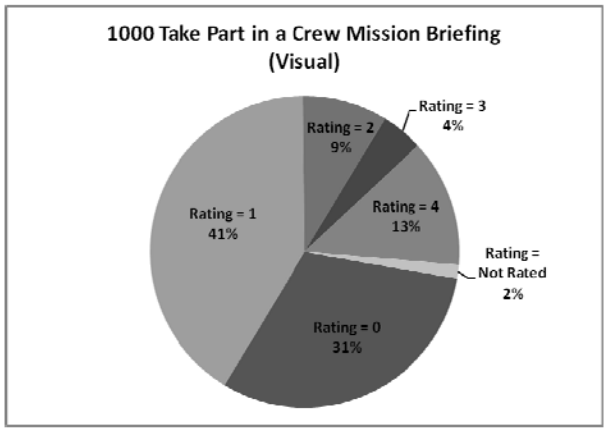


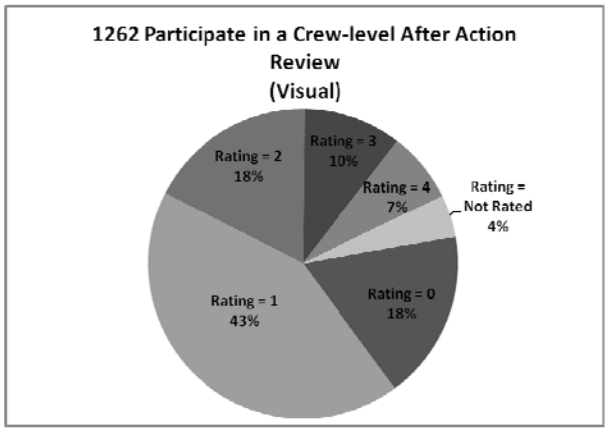


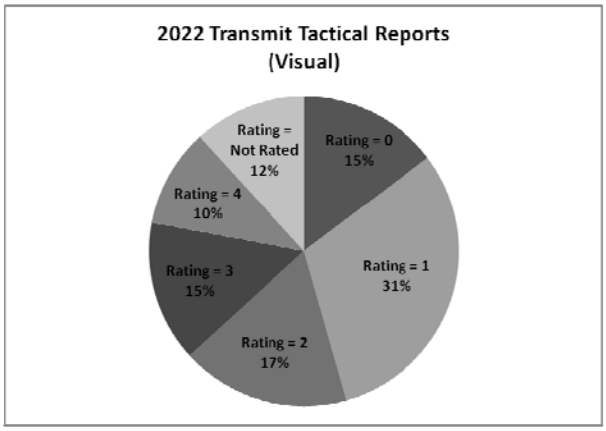


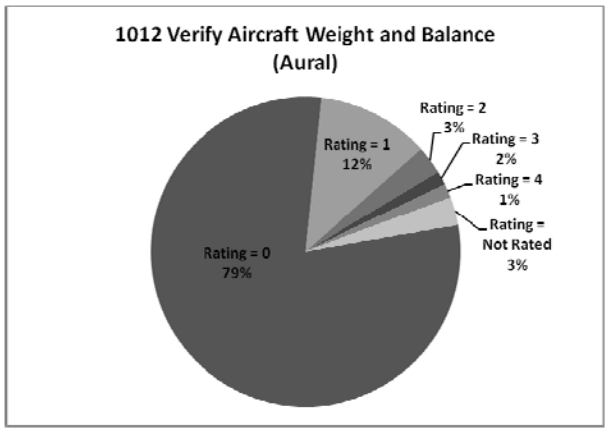

1032 Perform Radio Communication Procedures
(Visual)
Rating = 3
5%
Rating = 2
7%
Rating = 4
3%
Rating =
Not Rated
4%
Rating = 1
46%
Rating = 0
35%

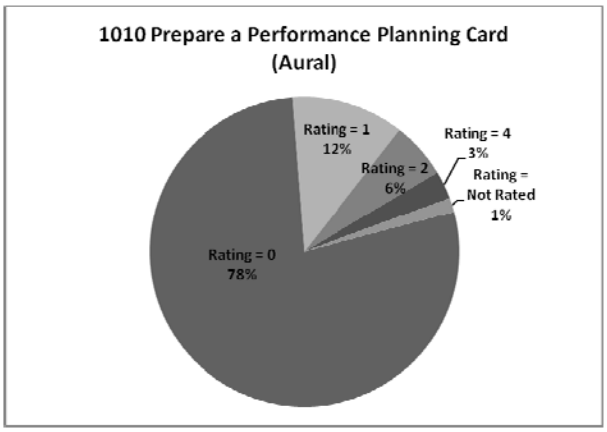

2098 Perform Aerial Radio Relay
(Visual)
Rating = 0
13%
Rating = 1
24%
Rating = 2
4%
Rating = 3
2%
Rating = 4
3%
Rating =
Not Rated
54%

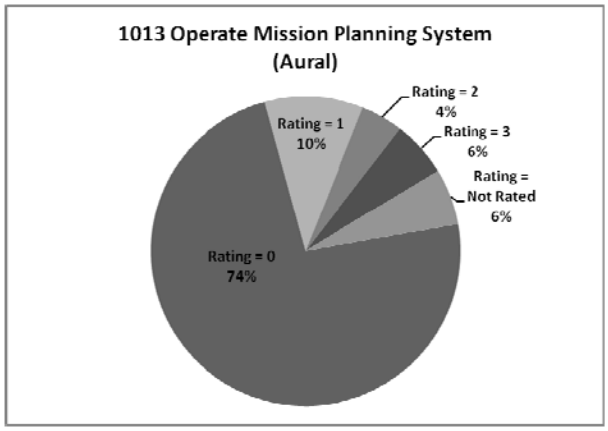

1000 Take Part in a Crew Mission Briefing
(Visual)
Rating = 3
4%
Rating = 2
9%
Rating = 4
13%
Rating = 1
41%
Rating =
Not Rated
2%
Rating = 0
31%

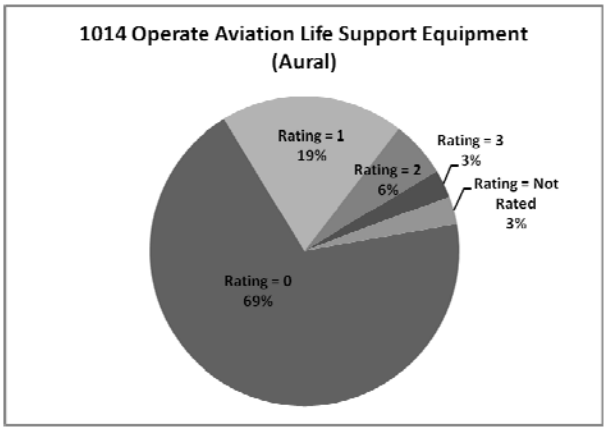

1262 Participate in a Crew-level After Action
Review
(Visual)
Rating = 3
10%
Rating = 2
18%
Rating = 4
7%
Rating =
Not Rated
4%
Rating = 1
43%
Rating = 0
18%

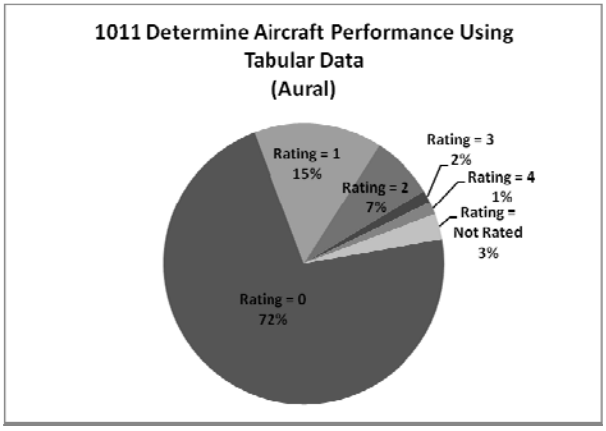

2022 Transmit Tactical Reports
(Visual)
Rating =
Not Rated
12%
Rating = 0
15%
Rating = 4
10%
Rating = 3
15%
Rating = 1
31%
Rating = 2
17%

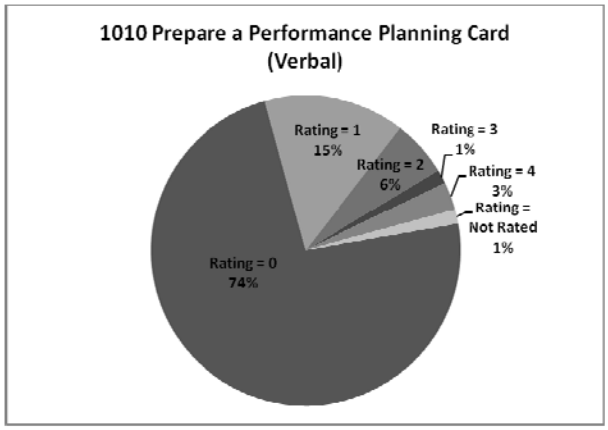

1012 Verify Aircraft Weight and Balance
(Aural)
Rating = 2
3%
Rating = 1
12%
Rating = 3
2%
Rating = 4
1%
Rating =
Not Rated
3%
Rating = 0
79%

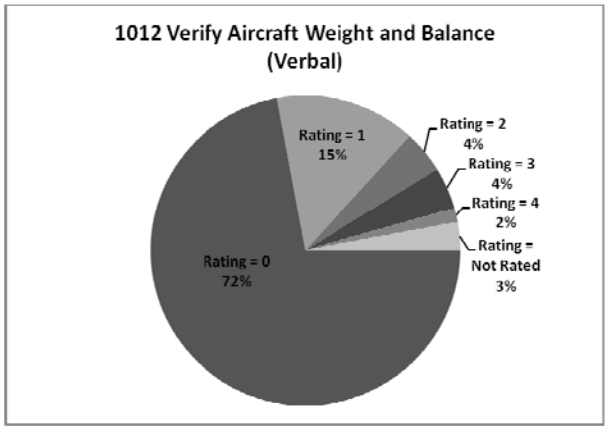

1010 Prepare a Performance Planning Card
(Aural)
Rating = 1
12%
Rating = 4
3%
Rating = 2
6%
Rating =
Not Rated
1%
Rating = 0
78%

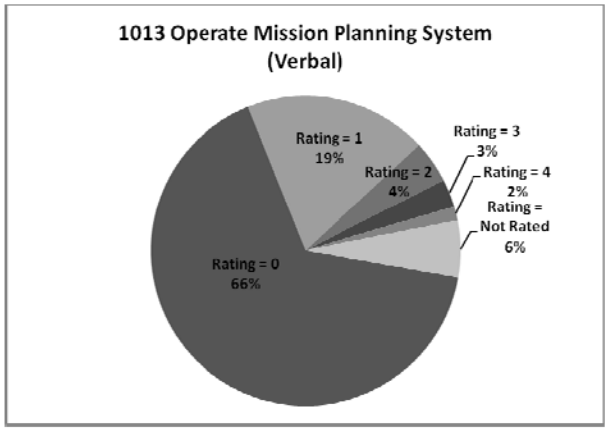

1013 Operate Mission Planning System
(Aural)
Rating = 2
4%
Rating = 1
10%
Rating = 3
6%
Rating =
Not Rated
6%
Rating = 0
74%

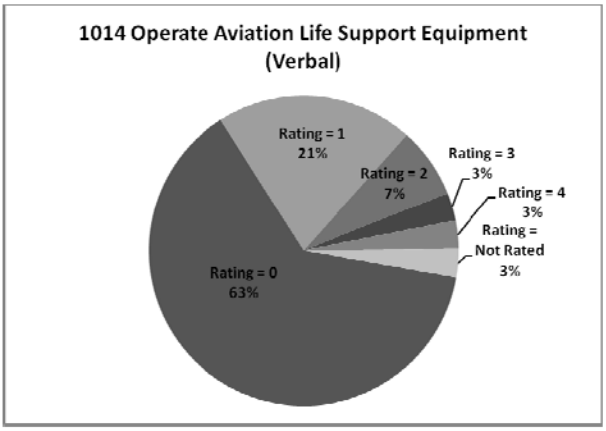

1014 Operate Aviation Life Support Equipment
(Aural)
Rating = 1
19%
Rating = 3
3%
Rating = 2
6%
Rating = Not
Rated
3%
Rating = 0
69%

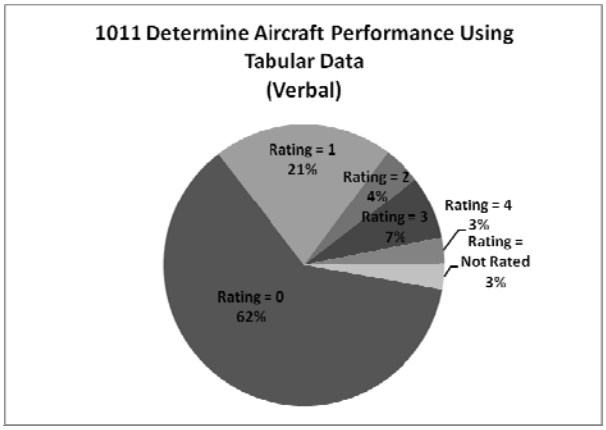

1011 Determine Aircraft Performance Using
Tabular Data
(Aural)
Rating = 3
2%
Rating = 1
15%
Rating = 2
7%
Rating = 4
1%
Rating =
Not Rated
3%
Rating = 0
72%

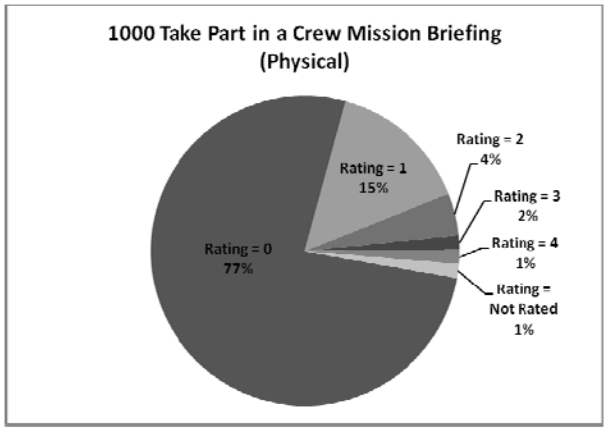

1010 Prepare a Performance Planning Card
(Verbal)
Rating = 1
15%
Rating = 3
1%
Rating = 2
6%
Rating = 4
3%
Rating =
Not Rated
1%
Rating = 0
74%

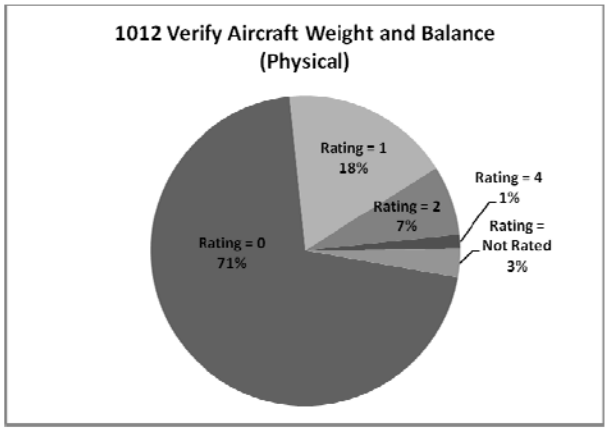

1012 Verify Aircraft Weight and Balance
(Verbal)
Rating = 1
15%
Rating = 2
4%
Rating = 3
4%
Rating = 4
2%
Rating =
Not Rated
3%
Rating = 0
72%

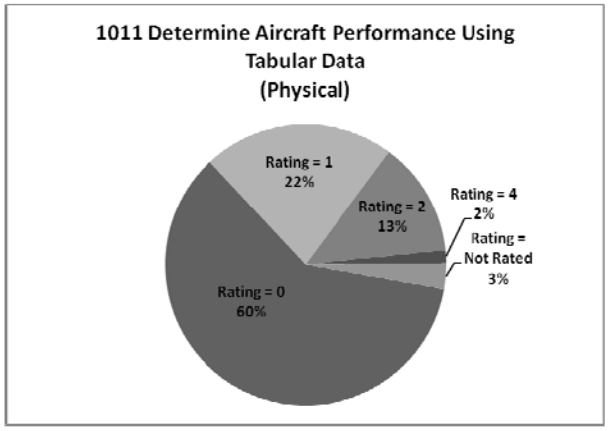

1013 Operate Mission Planning System
(Verbal)
Rating = 1
19%
Rating = 3
3%
Rating = 2
4%
Rating = 4
2%
Rating =
Not Rated
6%
Rating = 0
66%

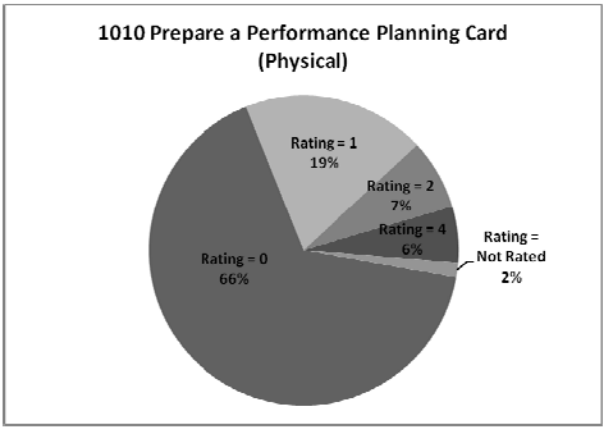

1014 Operate Aviation Life Support Equipment
(Verbal)
Rating = 1
21%
Rating = 3
3%
Rating = 2
7%
Rating = 4
3%
Rating =
Not Rated
3%
Rating = 0
63%

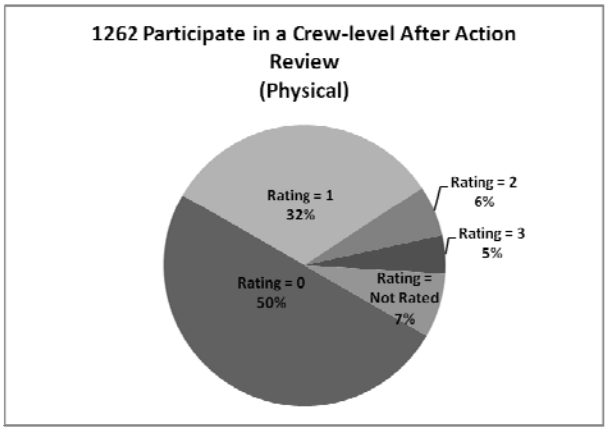

1011 Determine Aircraft Performance Using
Tabular Data
(Verbal)
Rating = 1
21%
Rating = 2
4%
Rating = 3
7%
Rating = 4
3%
Rating =
Not Rated
3%
Rating = 0
62%


1000 Take Part in a Crew Mission Briefing
(Physical)
Rating = 2
4%
Rating = 1
15%
Rating = 3
2%
Rating = 4
1%
Rating = 0
77%
Rating =
Not Rated
1%


1012 Verify Aircraft Weight and Balance
(Physical)
Rating = 1
18%
Rating = 4
1%
Rating = 2
7%
Rating =
Not Rated
3%
Rating = 0
71%


1011 Determine Aircraft Performance Using
Tabular Data
(Physical)
Rating = 1
22%
Rating = 2
13%
Rating = 4
2%
Rating =
Not Rated
3%
Rating = 0
60%


1010 Prepare a Performance Planning Card
(Physical)
Rating = 1
19%
Rating = 2
7%
Rating = 4
6%
Rating =
Not Rated
2%
Rating = 0
66%


1262 Participate in a Crew-level After Action
Review
(Physical)
Rating = 1
32%
Rating = 2
6%
Rating = 3
5%
Rating =
Not Rated
7%
Rating = 0
50%

Appendix D

Mean ratings by domain and experience (mean and standard deviation (*SD*) reported)

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
1000 : Crew mission briefing	2.72	1.38	2.76	1.18	1.33	1.38	1.14	1.21	2.50	1.55	2.45	1.57	2.80	1.39	2.91	1.19	0.38	0.81	0.27	0.70
1004:Plan a VFR flight	3.22	0.96	3.27	0.94	2.13	1.34	2.32	1.39	0.49	0.84	0.50	1.01	0.85	1.23	0.68	1.09	0.64	1.07	0.64	1.00
1006: Plan an IFR flight	3.37	0.83	3.41	0.91	2.17	1.34	2.41	1.44	0.44	0.81	0.55	1.06	0.83	1.18	0.68	1.09	0.62	0.96	0.64	1.00
1010: Prepare performance planning card	3.26	1.00	3.14	1.13	2.04	1.33	2.50	1.41	0.38	0.81	0.32	0.95	0.47	0.89	0.36	0.95	0.56	1.01	0.64	1.18
1011 Determine aircraft performance using tabular data	3.13	1.15	3.19	0.93	2.20	1.41	2.52	1.44	0.47	0.92	0.29	0.56	0.76	1.21	0.43	0.68	0.56	0.92	0.57	0.68
1012 Verify aircraft weight and balance	2.46	1.22	2.45	1.22	1.98	1.39	2.18	1.37	0.36	0.84	0.14	0.47	0.57	1.02	0.18	0.50	0.36	0.81	0.45	0.67
1013 Operate mission planning system	3.13	0.93	2.95	1.07	2.48	1.31	2.62	1.28	0.44	0.88	0.29	0.78	0.53	0.91	0.29	0.72	0.80	1.17	0.48	0.75
1014 Operate aviation life support equipment	1.72	1.13	1.86	0.94	1.59	1.17	2.05	1.21	0.43	0.76	0.36	0.73	0.64	1.06	0.45	0.80	1.11	1.03	1.09	0.75
1016 Perform internal load operations	2.09	1.10	2.23	1.15	1.68	1.01	1.91	1.27	0.55	0.86	0.50	1.06	0.74	0.95	0.68	1.17	1.59	1.26	1.64	1.33
1020 Prepare aircraft or mission	2.23	1.10	2.18	1.26	2.11	1.32	2.64	1.26	0.67	1.02	0.64	1.05	1.14	1.19	0.91	1.15	1.98	1.17	2.05	1.17
1022 Perform preflight inspection	2.41	1.24	2.14	1.21	3.14	1.21	3.00	1.23	0.86	1.13	0.77	1.15	1.26	1.11	0.86	1.08	2.64	1.12	2.55	1.30
1024 Perform before-starting-engine through before-leaving-helicopter checks	2.98	1.11	2.64	1.14	3.02	1.04	2.73	1.12	2.54	1.21	2.05	1.17	2.67	1.14	2.27	1.24	1.83	1.20	1.55	1.01
1026 Maintain airspace surveillance	2.36	1.26	1.77	1.45	3.67	0.70	3.32	1.04	2.20	1.29	1.41	1.18	2.16	1.26	1.55	0.96	1.30	1.21	0.95	1.17
1028 Perform hover power check	2.15	1.21	2.00	1.15	2.38	1.07	2.05	1.21	1.32	0.88	1.14	1.04	1.50	1.00	1.14	0.99	1.95	1.41	1.32	1.04
1032 Perform radio communication procedures	2.38	1.21	2.18	1.18	0.81	0.91	1.05	1.05	3.04	1.07	2.76	1.34	3.02	1.01	2.86	1.31	0.93	1.01	0.76	0.94
1034 Perform ground taxi	1.93	1.30	2.00	1.15	2.70	1.17	2.55	1.10	1.09	1.02	1.09	0.97	1.02	0.87	1.09	0.81	2.44	1.27	1.77	0.97

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
1038 Perform hovering flight	2.20	1.24	1.95	1.29	2.87	1.11	2.86	1.08	1.27	1.11	1.14	0.99	1.16	1.00	1.18	0.91	2.72	1.17	1.95	0.84
1040 Perform visual meteorological conditions takeoff	2.11	1.30	1.95	1.21	2.93	1.14	3.05	0.95	1.25	0.92	1.14	1.04	1.20	0.89	1.23	0.87	2.67	1.23	1.91	1.02
1044 Navigate by pilotage and dead reckoning	3.00	1.04	2.68	1.25	3.18	0.89	3.23	1.02	1.61	1.22	1.50	1.06	2.13	1.14	1.91	0.92	1.81	1.28	1.45	1.06
1046 Perform electronically aided navigation	2.71	0.94	2.27	1.24	2.82	0.98	2.68	0.99	1.55	1.19	1.32	1.04	1.77	1.10	1.45	0.91	1.60	1.33	1.14	0.99
1048 Perform fuel management procedures	2.35	1.16	2.36	1.22	1.93	1.10	2.05	1.00	1.02	1.06	0.86	0.89	1.20	0.97	1.05	0.79	0.91	0.95	0.86	0.94
1052 Perform visual meteorological conditions flight maneuvers	2.51	1.14	2.23	1.27	2.98	1.14	3.14	1.04	1.16	0.89	1.55	1.30	1.27	0.90	1.68	1.09	2.62	1.23	1.91	0.92
1054 Select landing zone/pickup zone/holding area	2.74	1.09	2.24	1.22	2.98	1.06	3.14	1.06	1.12	1.02	1.19	1.17	1.31	1.00	1.48	1.08	1.38	1.33	1.19	0.93
1058 Perform visual meteorological conditions approach	2.50	1.22	2.18	1.26	3.00	1.10	3.09	1.11	1.18	0.89	1.59	1.30	1.24	0.93	1.64	1.00	2.70	1.24	1.86	0.89
1062 Perform slope operations	2.87	1.04	2.68	1.21	3.13	1.01	3.32	0.99	1.40	1.10	1.55	1.26	1.62	1.03	1.73	1.03	3.00	1.11	2.55	1.01
1064 Perform a roll-on landing	2.72	1.17	2.50	1.26	3.16	1.00	3.32	1.04	1.33	1.11	1.36	1.18	1.40	0.99	1.68	1.17	3.02	0.94	2.55	0.91
1068 Perform go-around	2.59	1.27	2.50	1.19	2.78	1.26	3.00	1.20	1.49	1.14	1.55	1.14	1.57	1.07	1.64	0.95	2.39	1.22	1.86	0.94
1070 Respond to emergencies	3.46	0.98	3.50	0.86	3.17	0.90	3.00	1.23	2.80	1.05	2.64	1.22	2.70	1.15	2.45	1.10	2.67	1.06	2.59	1.22
1082 Perform autorotation	3.20	1.05	3.00	1.27	3.39	0.93	3.45	0.96	2.13	1.22	1.95	1.09	2.20	1.15	1.82	1.10	3.30	1.01	2.91	0.92
1114 Perform a rolling takeoff	2.80	1.20	2.68	1.29	3.18	1.15	3.09	1.11	1.47	1.12	1.36	0.95	1.67	1.09	1.55	0.86	2.96	1.07	2.55	1.18
1142 Perform digital communications	2.08	1.19	2.41	1.06	2.09	1.24	2.24	1.03	1.83	1.30	1.71	1.40	1.65	1.27	1.29	1.31	1.32	1.28	0.94	1.03
1155 Negotiate wire obstacles	2.33	1.09	2.18	1.30	3.33	0.95	3.23	1.19	1.23	0.99	1.59	1.37	1.52	0.90	1.45	1.10	1.93	1.27	1.59	1.01

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
1162 Perform emergency egress	2.24	1.00	2.23	1.31	2.31	1.10	2.23	1.27	1.58	1.25	1.68	1.32	1.93	1.27	1.73	1.45	2.66	1.29	3.05	1.17
1166 Perform instrument maneuvers	3.17	1.02	3.09	1.19	3.20	0.97	3.23	0.97	1.87	1.34	2.05	1.36	1.91	1.22	2.14	1.21	2.50	1.13	2.18	0.85
1168 Perform command instrument system procedures	2.87	0.86	2.73	1.03	2.83	1.06	2.77	1.15	1.20	1.10	1.14	1.13	1.47	1.10	1.41	1.01	1.54	1.13	1.32	0.84
1170 Perform instrument takeoff	2.91	1.06	2.77	1.07	3.34	0.86	3.00	1.15	1.40	0.95	1.68	1.04	1.47	0.83	1.64	1.00	2.57	1.30	1.91	1.11
1174 Perform holding procedures	3.04	0.80	3.32	0.89	2.91	1.07	2.91	1.19	1.49	0.91	1.68	1.17	1.44	0.80	1.68	0.99	2.23	1.34	1.73	1.12
1176 Perform nonprecision approach	3.11	0.93	3.00	1.07	3.02	1.07	3.00	1.15	1.51	0.86	1.73	1.20	1.49	0.74	1.77	1.07	2.30	1.37	1.55	1.10
1178 Perform precision approach	3.09	0.92	2.95	1.09	3.07	1.04	2.95	1.13	1.58	0.91	1.77	1.27	1.47	0.77	1.73	1.08	2.34	1.36	1.55	1.10
1180 Perform emergency global positioning system recovery procedure	3.18	0.92	3.00	0.95	3.07	1.05	2.86	1.11	1.51	0.93	1.71	1.42	1.49	0.75	1.86	1.35	2.14	1.35	1.70	1.17
1182 Perform unusual attitude recovery	3.16	1.00	2.73	1.24	3.43	0.97	3.32	0.99	1.58	1.12	1.36	1.22	1.74	0.98	1.59	1.14	2.86	1.23	2.23	1.23
1184 Respond to inadvertent instrument meteorological conditions	3.49	0.87	3.23	0.92	3.52	1.02	3.18	1.01	2.00	1.28	1.86	1.13	2.27	1.02	2.05	1.05	3.09	1.12	2.18	1.30
1188 Operate aircraft survivability equipment	2.20	1.10	1.95	1.09	1.91	1.06	2.00	1.15	1.53	1.08	1.05	0.84	1.33	0.84	1.09	1.06	1.21	1.16	1.50	1.19
1190 Perform hand and arm signals	2.07	1.11	2.17	1.15	2.73	1.26	2.67	1.50	0.67	0.77	0.56	0.98	0.90	0.94	0.72	1.23	1.51	1.27	1.72	1.27
1194 Perform refueling operations	1.75	1.08	2.09	1.19	2.09	1.13	2.14	1.21	1.35	1.02	1.00	1.20	1.47	0.96	1.09	0.97	1.02	0.90	1.14	1.21
1253 Operate flight management system/central display unit	1.83	1.70	2.89	1.27	2.46	1.51	3.00	1.32	0.85	1.07	0.78	0.97	1.00	1.00	1.00	1.22	1.08	1.38	1.56	1.33
1254 Operate multifunction display	1.92	0.47	2.57	0.48	2.33	1.10	3.43	1.27	0.55	1.25	0.86	1.32	0.82	1.27	1.14	1.45	0.82	1.29	1.29	1.17

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
1262 Participate in a crew-level after action review	2.32	1.18	2.73	1.20	1.42	1.03	1.50	1.37	2.21	1.32	2.77	1.48	2.44	1.30	2.73	1.16	0.63	0.80	0.59	0.85
2010 Perform multiaircraft operations	3.02	0.88	2.95	1.09	3.63	0.72	3.59	0.85	1.86	1.26	2.05	1.29	2.07	0.96	2.05	1.09	3.07	1.03	2.64	1.09
2012 Perform tactical flight mission planning	3.20	1.05	3.14	1.04	2.70	1.06	2.77	1.15	1.07	0.88	0.91	1.19	1.37	0.90	1.00	1.20	1.00	1.04	1.09	1.06
2014 Perform electronic countermeasures/electronic counter-countermeasures procedures	2.50	1.07	2.06	1.25	2.40	1.00	1.94	1.30	1.62	1.08	1.24	0.97	1.66	0.81	1.06	1.03	1.14	0.89	1.06	1.09
2022 Transmit tactical reports	2.33	1.10	2.55	1.15	1.58	1.15	2.00	1.45	1.90	1.22	2.05	1.36	2.71	1.17	2.70	1.13	0.82	0.85	0.80	1.06
2024 Perform terrain flight navigation	3.11	0.87	3.23	1.02	3.37	0.85	3.59	0.85	1.74	1.13	1.55	1.06	2.02	1.06	1.82	1.05	1.64	1.36	2.14	1.36
2026 Perform terrain flight	2.84	0.96	3.09	1.06	3.60	0.82	3.59	0.80	1.57	1.04	1.59	1.10	1.65	0.92	1.68	1.17	2.77	1.36	2.59	1.30
2034 Perform masking and unmasking	2.50	1.00	2.41	1.18	3.30	0.91	3.14	1.13	1.60	0.98	1.55	1.10	1.74	0.90	1.77	1.11	2.65	1.25	1.82	1.14
2036 Perform terrain flight deceleration	2.52	1.05	2.41	1.18	3.16	1.07	2.91	1.11	1.45	1.04	1.68	1.29	1.52	0.86	1.55	1.18	2.63	1.22	2.19	1.03
2042 Perform actions on contact	3.05	0.94	2.73	1.16	3.35	1.04	3.05	1.17	2.28	1.26	2.55	1.34	2.42	1.18	2.50	1.30	3.05	1.17	2.68	1.17
2048 Perform sling load operations	2.95	1.06	2.86	1.06	3.08	1.06	3.14	0.96	2.31	1.13	2.05	1.28	2.15	1.06	2.10	0.94	2.97	1.09	2.90	0.77
2050 Develop an emergency global positioning system recovery procedure	3.29	1.27	3.25	1.04	2.48	1.41	2.63	1.06	0.83	0.78	0.63	1.06	0.96	0.88	0.63	1.06	0.91	1.12	1.25	1.28
2052 Perform water bucket operations	2.89	1.34	3.00	1.05	2.89	1.25	3.10	1.20	2.11	1.31	2.20	1.23	1.89	1.01	2.40	0.97	2.78	1.34	2.60	1.35
2054 Perform fast-rope insertion and extraction system operations	2.90	1.30	3.25	0.89	3.15	1.14	3.38	0.52	2.20	1.28	2.63	0.92	1.95	1.15	2.63	0.74	3.00	1.45	3.00	1.31
2056 Perform rappelling operations	3.00	1.24	2.90	0.99	3.27	1.00	3.00	1.05	2.35	1.20	2.50	1.08	2.19	1.13	2.20	1.03	3.04	1.25	2.30	1.16

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
2058 Perform special patrol infiltration/exfiltration system operations	2.76	1.52	3.33	0.82	3.18	1.29	3.33	0.52	2.38	1.20	2.83	0.75	2.19	1.22	2.67	0.82	2.69	1.58	3.00	1.22
2060 Perform rescue hoist operations	2.78	1.35	2.89	1.05	3.14	1.13	3.33	1.12	2.41	1.30	2.78	1.20	2.23	1.19	2.44	1.24	2.86	1.36	2.78	1.09
2061 Operate forward looking infrared system	1.83	1.60	2.00	1.00	2.20	1.64	3.67	0.58	1.00	1.00	0.33	0.58	1.00	1.00	0.33	0.58	1.00	1.73	1.00	1.00
2063 Operate storm scope weather mapping system	2.20	1.40	1.75	0.96	2.33	1.50	3.00	1.15	0.56	0.88	0.50	0.58	0.78	0.83	0.50	0.58	0.33	0.71	0.75	0.50
2064 Perform paradrop operations	2.59	1.30	2.38	1.06	2.71	1.27	2.13	1.36	2.00	1.14	1.75	0.71	1.95	0.86	1.75	1.04	2.62	1.40	1.50	0.76
2065 Operate personnel locater system	2.40	1.30	2.50	1.05	2.21	1.37	3.00	1.10	1.64	1.08	2.17	0.75	1.50	0.85	1.33	1.21	1.14	1.23	1.00	0.89
2066 Perform extended range fuel system operations	2.68	0.99	2.00	1.12	2.54	1.06	1.67	1.12	1.04	0.81	1.00	1.00	1.33	0.76	1.22	0.97	1.25	0.90	1.33	1.00
2068 Perform shipboard operations	2.77	1.69	3.25	0.96	3.00	1.48	4.00	0.00	2.17	1.47	2.75	1.26	2.27	1.27	2.50	1.00	3.00	1.65	3.25	0.50
2070 Perform M-139 Volcano operations	2.00	1.50			2.50	1.51			1.75	1.39			1.88	1.25			2.00	1.77		
2075 Perform fat hawk operations	1.89	1.62	2.67	1.53	1.63	1.60	1.67	1.15	1.13	1.13	1.67	1.53	1.25	0.89	1.33	1.15	1.13	1.46	1.67	1.53
2076 Perform caving ladder operations	2.45	1.63	2.00	0.00	3.00	1.49	3.00	1.00	2.30	1.42	2.67	1.53	1.90	1.29	2.00	1.00	2.80	1.75	2.33	0.58
2078 Perform helocast operations	2.50	1.72	2.50	0.84	2.67	1.80	3.17	0.98	2.11	1.54	2.67	1.03	2.00	1.32	2.33	1.21	2.44	1.74	2.50	1.05
2081 Operate night vision goggles	2.81	1.27	2.59	1.22	3.68	0.76	3.59	0.73	1.31	1.32	1.32	1.39	1.44	1.31	1.45	1.34	2.67	1.42	2.05	1.25
2086 Operate aviator's night vision imaging system heads-up display	2.83	1.15	2.56	1.20	3.44	0.88	3.56	0.78	1.21	1.21	1.22	1.22	1.24	1.15	1.39	1.14	2.08	1.55	1.89	1.53

Task	Domain																			
	Cognitive				**Visual**				**Aural**				**Verbal**				**Physical**			
	IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud		IP		IP Stud	
	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*	mean	*SD*
2090 Perform landing area reconnaissance for simulated maximum gross weight	2.91	1.08	3.00	1.08	3.03	1.09	3.10	0.91	1.45	1.09	1.30	1.08	1.64	0.78	1.60	0.94	1.91	1.35	2.10	1.25
2092 Respond to night vision goggles failure	2.51	1.05	2.45	1.30	2.72	1.33	2.36	1.62	1.55	1.23	1.27	1.16	1.93	1.13	1.77	0.92	1.90	1.30	1.73	1.16
2093 Perform simulated maximum gross weight approach and landing	3.14	0.90	3.18	1.01	2.94	1.08	2.91	0.97	1.43	1.07	1.68	1.29	1.79	0.88	1.86	1.13	2.75	1.34	2.41	1.22
2095 Perform simulated maximum gross weight takeoff	3.03	1.04	3.05	1.00	2.86	1.03	2.86	0.99	1.54	1.07	1.73	1.24	1.75	0.87	1.86	0.99	2.73	1.35	2.27	1.12
2098 Perform aerial radio relay	1.83	1.10	2.38	0.87	1.11	1.08	1.00	1.08	1.56	1.20	2.69	0.95	1.67	1.28	2.54	0.97	1.06	0.94	1.00	0.91
2112 Operate armament subsystem	1.80	1.48	2.60	1.34	1.60	1.82	3.40	1.34	1.00	1.00	2.00	0.82	0.80	0.84	2.25	0.96	1.00	1.22	2.50	1.00
2116 Perform an aerial radiological survey	1.80	1.48	4.00	.	2.20	1.79	4.00	.	1.40	1.67	3.00	.	1.00	1.00	3.00	.	1.00	1.00	3.00	.
2120 Provide patient treatment at emergency medical-technician—basic, intermediate, or paramedic—level	1.67	1.37	3.75	0.50	1.33	1.51	3.75	0.50	0.83	0.98	3.25	0.96	1.17	0.75	2.75	0.50	2.33	1.63	3.25	0.96
2122 Perform advanced cardiac life support	1.80	1.48	3.67	0.58	1.40	1.14	3.33	1.15	1.00	1.00	3.00	1.00	1.60	1.14	2.67	0.58	2.60	1.67	3.00	1.73
2127 Perform combat maneuvering flight	3.36	0.93	2.94	1.06	3.45	0.79	3.31	0.95	1.67	1.08	2.63	1.20	1.94	1.06	2.50	1.21	3.24	1.17	3.06	0.93
2169 Perform aerial observation	2.68	1.36	2.67	1.05	3.29	1.08	3.27	1.10	1.37	0.93	1.80	1.08	1.82	1.06	1.73	0.96	1.85	1.38	1.80	1.08

Department of the Army
U.S. Army Aeromedical Research Laboratory
Fort Rucker, Alabama, 36362-0577
www.usaarl.army.mil

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